

AIR FORCE QUALIFICATION TRAINING PACKAGE (AFQTP)



for
STRUCTURAL
(3E3X1)

MODULE 14
TOOLS & EQUIPMENT

TABLE OF CONTENTS

MODULE 14
TOOLS & EQUIPMENT

AFQTP GUIDANCE

INTRODUCTION 14-3

AFQTP UNIT 1

USE

HANDTOOLS (14.1.1.).....14-4
CIRCULAR SAW (14.1.3.) 14-27
ELECTRIC DRILL (14.1.4.) 14-32
RECIPROCATING SAW (14.1.5.)..... 14-37
POWER MITER SAW (14.1.6.) 14-42
ROTARY HAMMER (14.1.8.)..... 14-47
HAND GRINDER (14.1.9.) 14-52

AFQTP UNIT 3

ERECT SCAFFOLDS AND LADDERS (14.3.) 14-57

REVIEW ANSWER KEYKey-1

Career Field Education and Training Plan (CFETP) references from 1 Apr 97 version.

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INTRODUCTION

Before starting this AFQTP, refer to and read the “Trainee/Trainer Guide” located on the AFCESA Web site <http://www.afcesa.af.mil/>

AFQTPs are mandatory and must be completed to fulfill task knowledge requirements on core and diamond tasks for upgrade training. *It is important for the trainer and trainee to understand* that an AFQTP ***does not*** replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks.

MANDATORY minimum upgrade requirements:

Core task:

AFQTP completion
Hands-on certification

Diamond task:

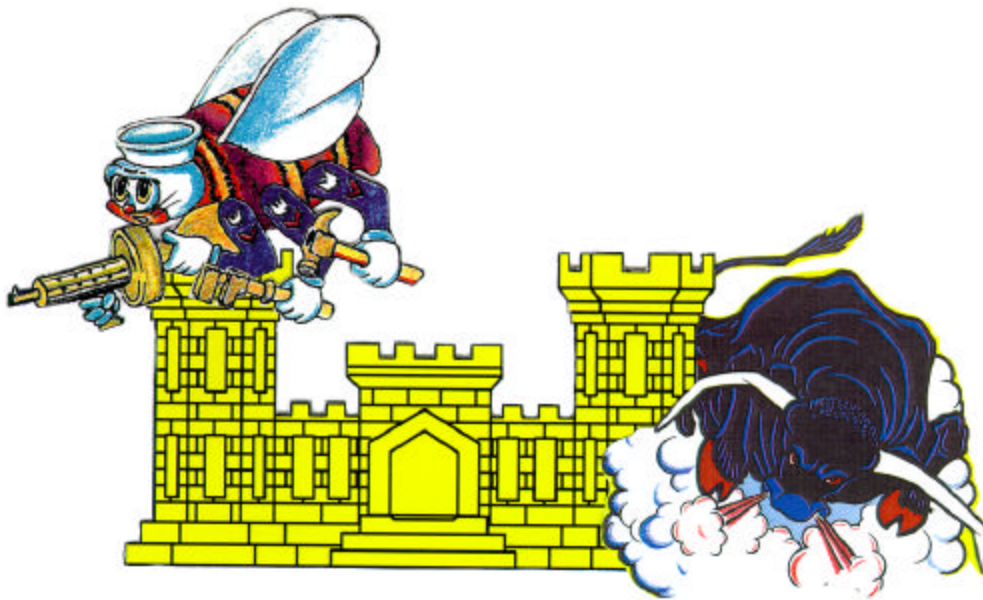
AFQTP completion
CerTest completion (80% minimum to pass)

Note: *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location.*

Put this package to use. Subject matter experts under the direction and guidance of HQ AFCESA/CEOT revised this AFQTP. If you have any recommendations for improving this document, please contact the Structures Career Field Manager at the address below.

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USE

MODULE 14

AFQTP UNIT 1

HANDTOOLS (14.1.1.)

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HANDTOOLS***Task Training Guide***

STS Reference Number/Title:	14.1.1. Handtools
Training References:	<ul style="list-style-type: none"> • 3E351 CDCs • Modern Carpentry by Willis H. Wagner • Modern Metalworking by John R. Walker • NAVEDTRA 12520
Prerequisites:	<ul style="list-style-type: none"> • Possess as a minimum 3E331 AFSC
Equipment/Tools Required:	<ul style="list-style-type: none"> • General 3E3X1 tool kit • Personal safety equipment • Scrap materials to practice on.
Learning Objective:	<ul style="list-style-type: none"> • Individual should be able to describe the procedures for using and maintaining hand tools.
Samples of Behavior:	<ul style="list-style-type: none"> • Trainee will be able to successfully and safely use hand tools.
Notes:	
<ul style="list-style-type: none"> • Any safety violation is an automatic failure. 	

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HANDTOOLS

Background: Using the right piece of equipment, such as the correct saw, chisel, or drill bit, determines how the finished project will look. This is especially true when using handtools. Handtools are well made, and if properly maintained, they should last for very long periods of time. You should keep your handtools in a toolbox, chest, or bag to prevent damage to them when they're not being used. To prevent rust, tools that have sharp cutting edges, such as saws, chisels, or drill bits, should always be cleaned and lightly oiled after they are used. The tools that you'll be using as a Structural journeyman have been divided into two categories, hand and power tools. As a Structural journeyman, you'll be using these tools and others to perform your daily duties. Keep in mind that we are not going to discuss every conceivable tool you'll be using, just some of the most common ones, including:

Types of handsaws: Handsaws can be divided into two general classes: One for cutting parallel to wood grain, or "ripping", and one for cutting at right angles to wood grain, or "crosscutting". The size of a saw is determined by the length of its cutting edge in inches. Usually the crosscut or ripsaw is from 18 to 26 inches in length. The number of teeth points per inch determines coarseness of the saw. The blade of a handsaw should have a light coating of oil on it at all times to prevent rust and to lubricate it while cutting. On all handsaws, every other tooth is bent slightly in opposite directions. This is called set. The purpose of having set in a saw is to produce a cut or "kerf" that is slightly wider than the thickness of the saw blade. The kerf helps to guide the saw and keep it straight after the cut is started. The type of material that you saw will determine the amount of set that is necessary to keep your saw from binding. More set is required to saw a wood with high-moisture content than is required for sawing a dry wood.

- **Ripsaw:** The general appearance of the ripsaw and crosscut saw is the same. The arrangement of the teeth, however, is a major difference. The number of teeth points is usually 4 1/2 or 5 1/2 per inch on a ripsaw blade. The teeth are chisel shaped because they easily cut along the wood grain. The teeth are filed at right angles to the blade from both sides of the saw. You should not use a ripsaw for cutting across wood grain because a ripsaw tears the wood fibers and leaves a rough cut.
- **Crosscut saw:** The number of points on a crosscut saw is usually 8 to 11 teeth points per inch of blade. The crosscut teeth are filed with both sides of the teeth on an angle. Crosscut saws, as the name implies, are designed to cut across the wood grain.

Other types of saws that are commonly used in carpentry are: the backsaw; nest of saws; coping saw; and hacksaw. Like handsaws, each of these saws has a specific use.

- **Backsaw:** A backsaw has a thin blade that is reinforced with a steel strip along the top edge. It is often referred to as a miter saw because longer saws of this type are used in a miter box. The saw itself has fine teeth (14 to 16 points per inch) and produces a very smooth finished cut. Primarily, the backsaw is used with the miter box for interior finish work.

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- **Nest of saws:** A nest of saws is a set of different saw blades that can be used in the same handle. A “nested saw” can be purchased with a complete set of blades, but in most cases the keyhole saw or compass saw is purchased by your base as a single saw. The keyhole saw and compass saw are almost identical. The only difference is that the compass saw blade is wider. The primary use of both the keyhole and compass saw is to cut openings in gypsum board for electrical outlets.
- **Coping saw:** The coping saw is made up of a C-shaped metal frame that holds different types of narrow blades. The blade is fitted to the frame by loosening the handle and attaching the blade to the pin on the front of the saw frame and the pin on the saw handle. Tightening the handle applies tension and holds the blade in place. The blade should be placed on the frame with the teeth pointing toward the handle. The coping saw is designed for cutting very sharp inside or outside curves, usually on thin wood stock. Inside curves must have a hole through the stock for inserting the blade to start the cut. The coping saw is often used for making corner joints for molding in buildings that don’t have square wall corners. The finished joint looks like a mitered corner but one piece of the molding is “coped” to fit over the other piece.
- **Hacksaws:** Because of the wide range of work that a carpenter must be prepared to handle, a hacksaw should be included in your hand tool assortment. This saw is used to cut nails, bolts, other metal fasteners, and various metal trim used on both exterior and interior work. Most hacksaws have an adjustable frame, permitting the use of several sizes of blades. The hacksaw however, consists of a frame, handle, and blade. Hacksaw blades come in lengths from 6 to 16 inches; however, the 10-inch blade is the most common length used. Hacksaw blades are identified by their length and number of teeth per inch, or pitch. Blades with 14, 18, 24, and 32 teeth per inch are available. Blades are made of high-grade tool steel that may be flexible or all hard. The flexible blades have only hardened teeth, whereas all hard blades have hardened teeth and blades. Blade selection involves finding the right type for the job at hand. An all-hard blade is best suited for sawing brass, tool steel, cast iron, and heavy cross sections of material. Flexible blades are recommended for sawing hollow shapes and material having thin cross sections. The selection of a blade by its pitch is important. A blade with 14 teeth per inch is recommended for cutting cold roll and structural steel. The 18 teeth per inch blade is recommended for solid stock aluminum and cast iron. The 24 teeth per inch blade is recommended for cutting thick wall tubing, pipe, channel iron, and angle iron, as well as brass and copper. The 32 teeth per inch blade is the most common hacksaw blade used. This blade is recommended for thin wall tubing and all gauges of sheet metal.

As mentioned earlier each type of saw has a specific use, but the operation is basically the same. You should first choose the saw that best suits the task to be accomplished.

To perform the task, follow these steps:

Step 1: Selecting the right type of saw.

Choosing the right saw the first time will make your job a lot easier and produce a better finished product. For instance, you wouldn't want to cut inside trim with a ripsaw.

Step 2: Use a stable work surface.

A board that is to be cut should be placed on a sawhorse or a workbench. This will support the weight of the material and prevent the possibility of it slipping out of your hand.

Note:

Laying the material across your knee is not considered a stable work surface.

Step 3: Making the cut.

Mark the material where the cut is to be made. Start the cut on the waste (scrap) side of the line by making a few upward or pulling strokes. Make several short forward strokes until the kerf is deep enough to prevent the saw from slipping out. The full length of the saw should never be used as the cutting progresses.

Step 4: Maintenance.

You should always take care of your handsaws. They will require filing as well as setting. Before filing, they often require jointing. In this operation the height of the teeth are struck off evenly. Filing a saw is a tedious operation. Most carpenters prefer sending their saws to a shop where they can be machine sharpened by an expert. When a saw is only slightly dull, the teeth can often be sharpened with a few file strokes using a triangular saw file. Be sure to match the original angle of the teeth. File the back of one tooth and the front of an adjacent tooth in a single stroke.

Types of Hammers: This group of tools is used to drive nails, staples, wooden stakes, and other tools. In this section we discuss the different types and uses of hammers that you should be familiar with, including:

- **Claw Hammers:** The two types of claw hammers that are common to carpenters are the curved claw hammer and the ripping or straight claw hammer.
- **Straight Claw Hammers:** These are used most often for general or all-around rough work. These hammers are excellent for removing siding or other building material because of the head design. The face of a straight claw hammer may be either smooth or serrated. A serrated face on a hammer can cause damage to the wood when you're nailing, and you should not use this type of hammer for finish work. The advantage of a serrated head hammer is that when doing rough work (building or framing), the head is less likely to slip and bend nails.

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- **The Curved Claw Hammer:** These are frequently used for finish work and range in size from 7 to 20 ounces. The 13-ounce size is popular for general-purpose work.
- **The Drywall hammer:** This is a specially designed hammer used for the application of gypsum board. It is sometimes referred to as a drywall hatchet. The face of the drywall hammer is designed so that when you strike the finish blow to a nail, it dimples the surface without breaking the paper. The top of the drywall hammer can be used as a gauging device to obtain distance between sheets of drywall. It can also pull nails, with the V-shaped notch cut into the rear of the blade of the hammerhead.
- **Double-faced sledgehammers:** These hammers weigh between 2 and 20 pounds and have handles 15 to 36 inches in length. You should use them to drive wooden stakes for construction of wood forms for the foundation of a building or wall. Small sledgehammers are used for driving spikes, or with chisels for cutting pieces of metal. When driving wooden stakes for a building, you should use a 6-pound sledgehammer. Remember, sledgehammers are designed for striking wood or metal and should not be used for breaking rock or concrete.
- **Mallets:** These vary in weight and handle length and are used for different types of jobs. A wooden or rawhide mallet should be used for driving wood chisels. The rubber mallet is used for striking nailing machines. A neoprene or plastic head mallet has screw on heads that can easily be replaced. This mallet is very useful for general shop work if used properly because you can strike a wood surface without damaging it.

There are several steps to using hammers, including:

Step 1: Choosing a hammer.

Like all classes of handtools, different hammers are designed to do specific jobs. The size of a hammer is determined by the weight of its head. For obvious reasons heavier hammers are used for rough framing, while lighter ones are used for general purpose and finish work.

Step 2: Using hammers.

When hammers are used for driving fasteners, such as nails, spikes or stakes, get the fastener started by tapping it into the base material. Gradually increase the force used to drive it in until the fastener reaches the desired depth. When hammers are used for pulling nails, place a putty knife under the hammerhead to protect the surface. A block of wood under the head will increase leverage and also protect the surface.

SAFETY:

NAILS CAN OFTEN BE MIS-STRUCK, CAUSING THEM TO FLING IN ANY DIRECTION. FOR THIS REASON SAFETY GLASSES SHOULD ALWAYS BE WORN.

Step 3: Maintenance.

A hammer should be given good care. It is especially important to keep the handles tight and the face clean. If a wooden handle becomes loose, it can be tightened by driving the wedges deeper or by installing new ones.

Measuring and Layout Tools: Squares have a number of uses. They help produce a quality job while at the same time make your job easier. Great care should be given when using and storing squares. Throwing or banging them around will cause them to become out of true, giving you a false reading. Squares come in several sizes and styles to accommodate many different tasks, including:

- **Framing Square:** A framing square is an invaluable tool. Its uses are many and varied. The blade of the square is the widest and longest member. The tongue is shorter and narrower. The most commonly used framing square is the 16 by 24 inch style. The tables and scales on the square are used in rafter layout.
- **Try square:** The try square can be used to check the ends of lumber to ensure they are square (a 90 degree angle). It can also be used to check the inside and outside corners of interior work. The head of a try square is usually wood with brass trim near the blade to protect the wood from damage.
- **Combination square:** The combination square is an all steel tool consisting of two major parts: the blade and the handle. The 12 inch blade is grooved or slotted on one side, and allows you to move the handle to different positions. With the handle removed, the blade can be used as a rule or a straight edge. A spirit level installed in the head permits it to be used as a level. A scribe is also inserted into the head. It has a small cap nut and is similar in design to a finish nail. It is very handy when laying out work if you don't have a pencil. The blade and handle of the combination square are designed so that you can easily lay out 45 and 90 degree angles. It can also be used to draw parallel lines. A combination square performs many functions and can be used as a rule, square, depth gauge, and level.

Planes and Chisels: Often times you'll be required to use planes and chisels when completing certain jobs. Several common types include:

- **Standard surfacing planes:** These include the block plane, smooth plane, the jack plane, and the fore and jointer plane. The jackplane is commonly selected for general-purpose work. The block plane is very useful for the carpenter. The blade is mounted at a low angle and the bevel of the cutter is turned up. This plane produces a fine, smooth cut, making it suitable for fitting and trimming work.
- **Wood chisels:** These are used to trim and cut away wood or composition material to form joints or recesses. They also help when paring and smoothing small, interior surfaces that can't be reached by other edge tools. Wood chisels range in width sizes from 1/8 to 2 inches. A soft face hammer or mallet should always be used to drive the chisel when making deep cuts.

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When using planes or chisels, follow these steps:

Step 1: Adjusting planes.

To adjust a plane, hold the plane upside down and sight along the sole from the toe end. Then work the adjusting nut until the edge of the blade appears through the mouth. Next, move the lateral adjustment until the edge of the blade is aligned with the sole. Continue using the adjusting nut to give you the amount of blade protrusion that you need. The amount of blade depth depends upon the depth of cut that you want to make.

Step 2: Using planes.

The handle located at the rear of the plane is contoured for easy gripping. The front knob allows control of the plane when cutting. You should begin the end grained planing by marking a square line across the end of your wood stock. Clamp the wood stock into a vise as near the layout as possible. Adjust the block plane to make a fine cut and, holding the plane level, use light uniform hand pressure to push the plane toward the middle of the board. Then finish the cut from the opposite side of the board. You must be careful not to plane across the ends of the board from one direction. If you do, you will splinter the corners of the board. You can prevent splintering by placing a scrap of lumber against one side of the board.

Step 3: Using chisels.

If you need to make deep cuts, use a soft-faced hammer or mallet when driving chisels. When finishing wood joints, or trimming or shaping wood, you should turn the toe-beveled side of the chisel up. When making concave cuts, or for cutting to depth, you should turn the beveled side of the chisel down for better control of the tool.

Step 4: Maintenance.

It is a simple matter to hone edge tools on an oilstone. For tools with single bevel edges like planes and chisels, place the tool on the stone with the bevel flat on the surface. Raise the back edge of the tool a few degrees so only the cutting edge is in contact. Now place the back of the tool flat on the oilstone and stroke lightly several times. Turn the tool over and again stroke the beveled side lightly. Repeat this total operation several times until the wire edge can be honed a number of times before grinding is required.

Fastening tools: Screwdrivers, pliers, and wrenches will be used often by Structural journeymen for a wide variety of jobs. There will be times when it's difficult to carry a large number of tools to a job, that's when these tools will come in handy. There are many different types of these tools, including:

- **Pliers:** There are many types of pliers, here are a few of the common ones:
 - **Slip-joint pliers:** These are available in lengths ranging from 6 to 10 inches. They have a two-position jaw that allows a normal or wide jaw opening.
 - **Side cutting pliers (lineman's pliers):** These have cutters that can be used to cut small diameter nails or wire. They also have a flat nose suitable for removing small nails.
 - **End nippers (carpenter's pinchers):** These can also be used for cutting nails and wire. These flat nose cutters are useful when cutting nails flush with the surface.
- **Wrenches:** There are many types of wrenches that come with the portable power tools that we are going to cover. Most shops will have wrenches to perform minor equipment maintenance. Each wrench is unique in design and must be used for the purpose it was designed. Some of these include:
 - **Adjustable wrenches:** These are available from 4 to 18 inches in length. This type of wrench can be used to tighten nuts and bolts from 1/2 to 2-1/16 inches in size.
 - **Open-end wrench:** You should always select the wrench so that it fits a nut or bolt head correctly. Always be sure that a nut or bolt head is fully seated in the jaw openings of the wrench before you try to tighten or loosen a nut or turn a bolt.
 - **Box-end wrenches:** These are made to completely enclose a nut or bolt head and, if used correctly, will not slip. These wrenches are designed to tighten nuts that are difficult to fasten with open-end wrenches and to tighten nuts when working in close spaces.
 - **Allen wrenches:** These are made of casehardened steel and have six sides. They are designed for fastening Allen-type screws and setscrews on equipment. Allen wrenches are sometimes referred to as hex-key wrenches.
 - **Nut drivers:** These are designed to fit hex (six-sided) nuts ranging in sizes from 3/16 to 1/2 inch. Some types of nut drivers have a straight shank on which you can fasten different sizes of socket wrenches. Nut drivers are used in the same manner as screwdrivers.

- **Ratchets:** These come in a variety of sizes, which are determined by the size of the square shank located on the bottom of the tool. You control the direction you want a ratchet handle to turn by adjusting the stem located in the head part of the ratchet handle. Socket wrenches come in sizes to fit the shank on the ratchet handle. The size of socket wrenches available to fit a standard ratchet may range from 6 to more than 200 different types.

Masonry handtools: Masonry handtools are few in comparison to carpentry handtools. Proper maintenance of masonry tools can't be over emphasized because without proper care you will soon have nothing but rust. Several of the common handtools include:

- **Trowels:** There are many sizes, shapes, and weights of trowels. They are used to lay brick, block and to finish concrete. You should always keep your trowel clean of mortar and wipe it off with a clean oily rag if you're not going to use it for several days. Figure 1 shows some of the different types of trowels.

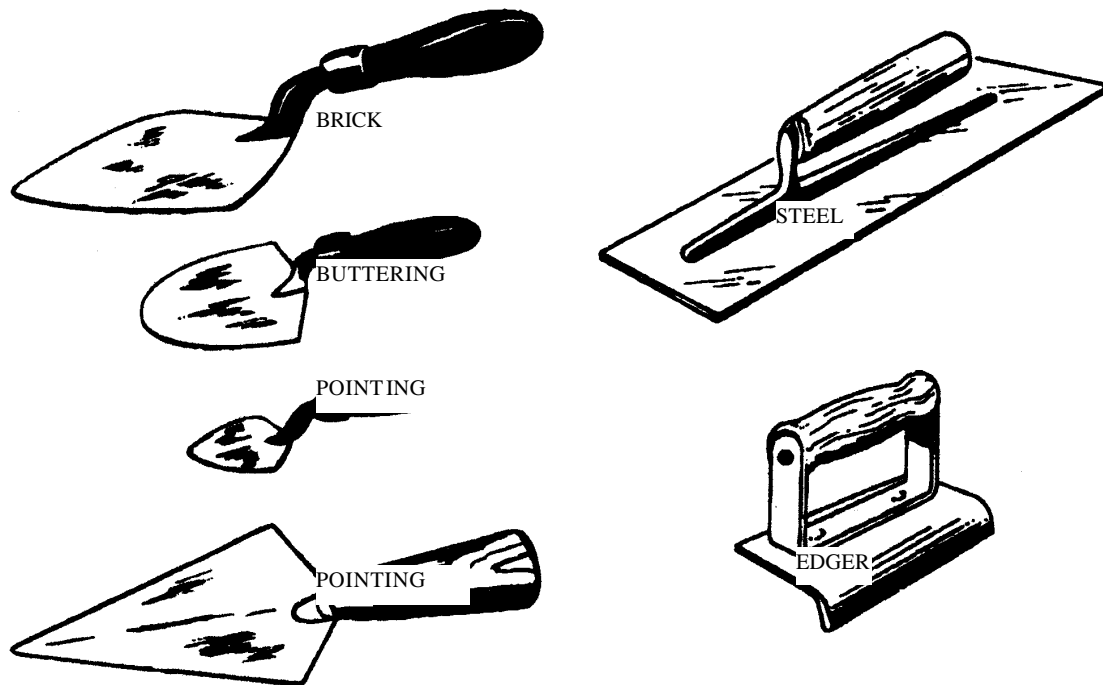


Figure 1, Types of trowels

Brick set: The brick set is used to cut brick, block, or Structural tile. The only maintenance required is occasional sharpening on a grinder. Figure 2 below shows how to cut brick with a brick set.

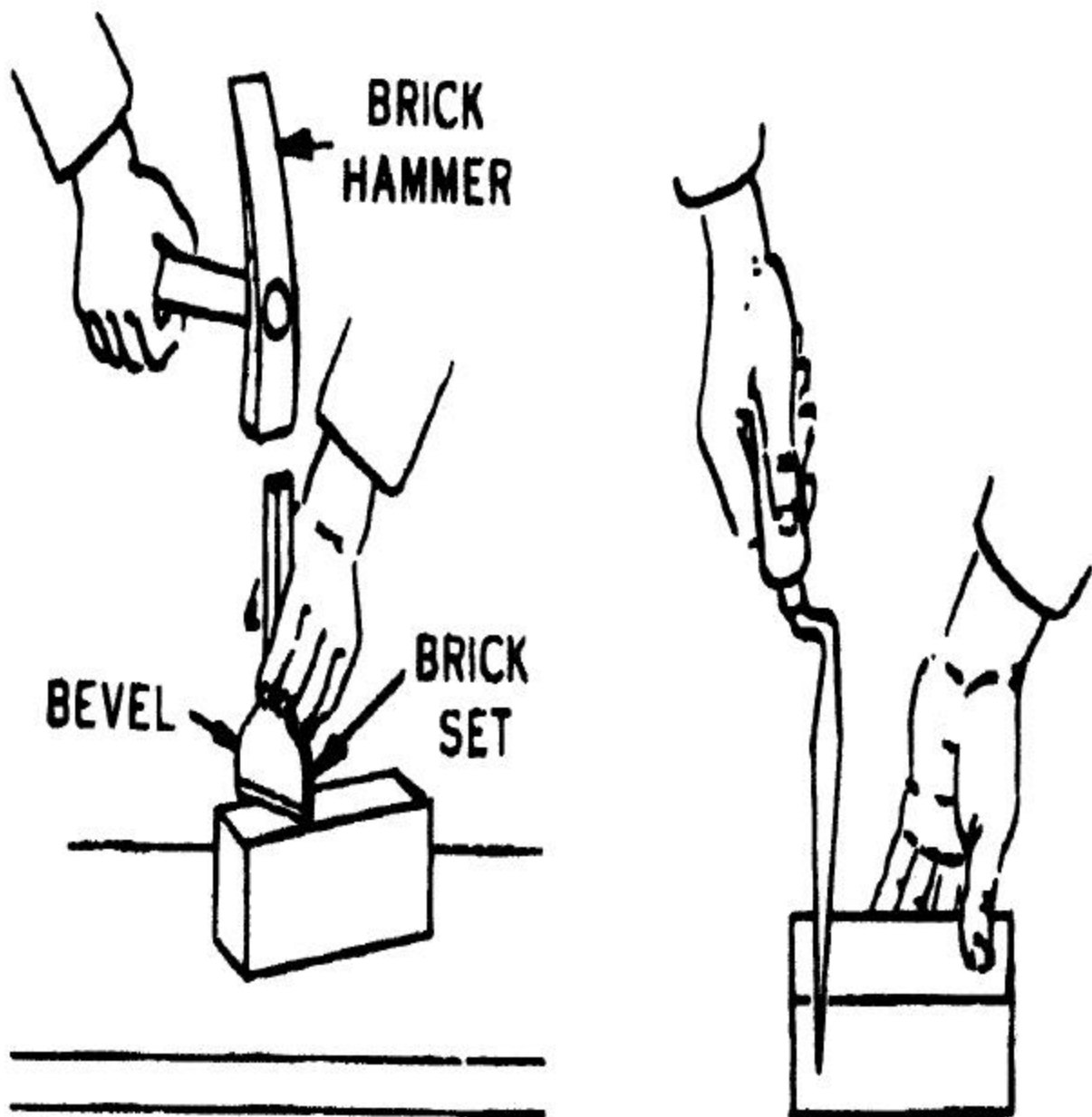


Figure 2, Cutting brick with a brick set.

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- **Jointer:** The jointer is used to finish masonry joints. Several sizes and designs are available for use. Figure 3 shows several different types.

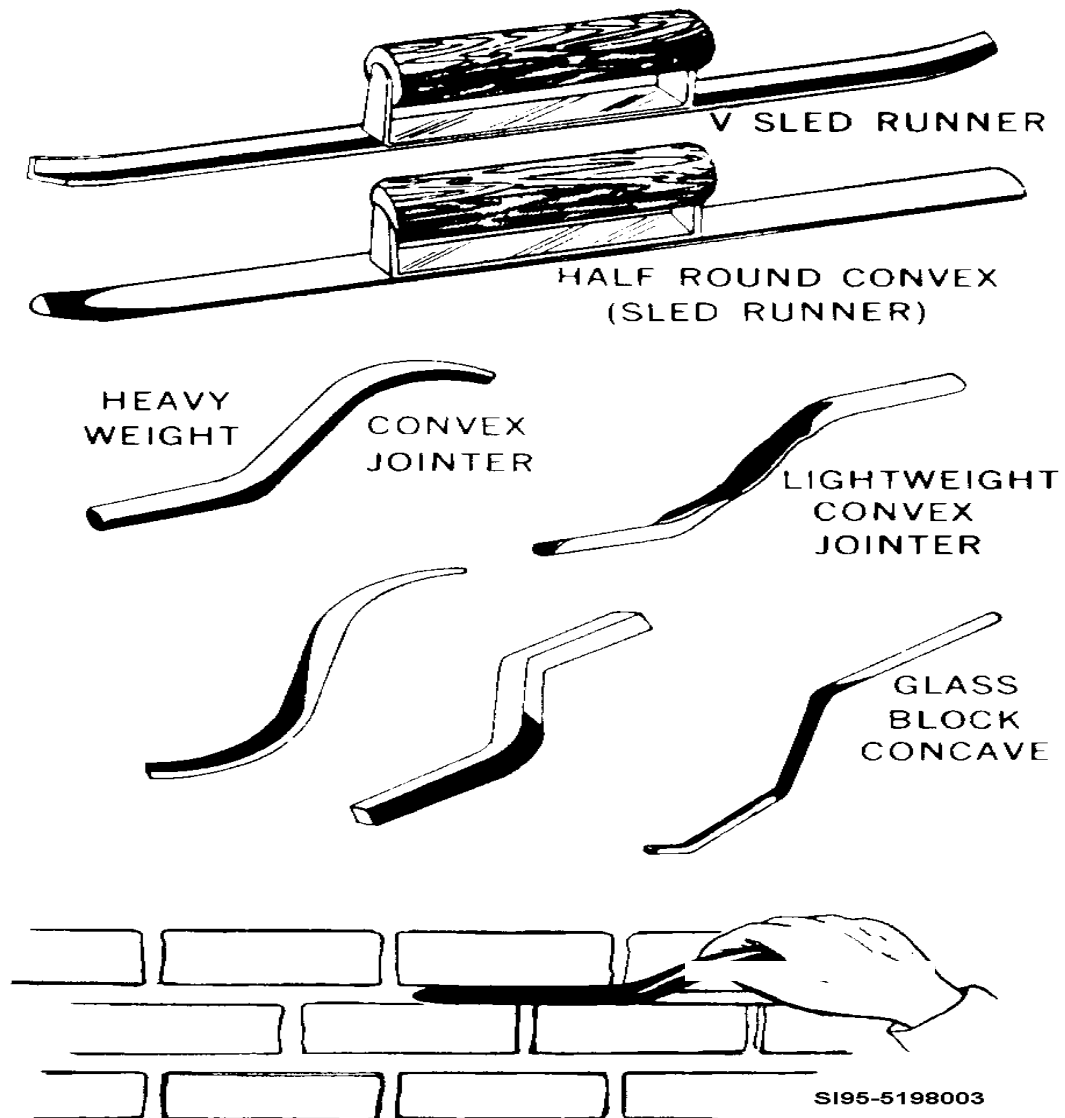
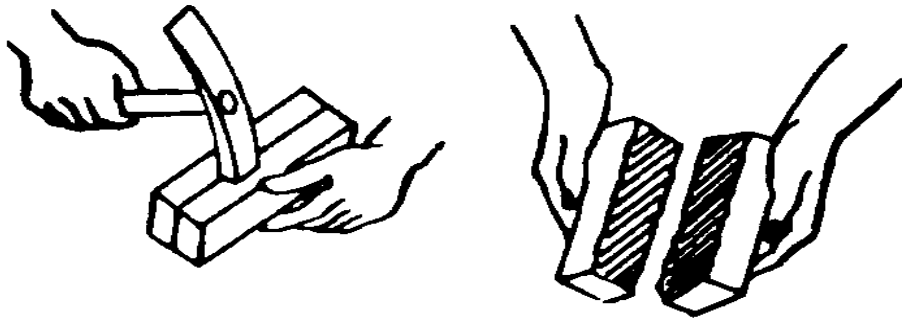


Figure 3, Jointers and how they are used.

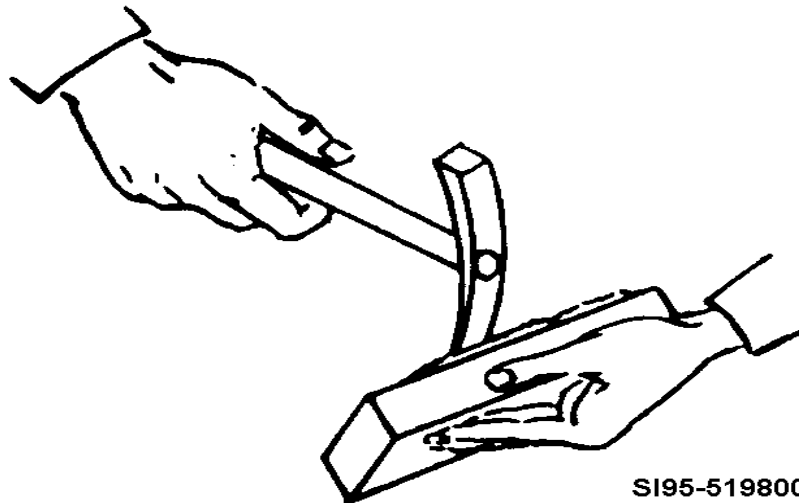
- **Brick hammer:** The brick hammer is used to break and chip bricks. You should always keep the chisel side sharp and free from nicks by shaping it with a grinder. Figure 4 shows how to properly use a brick hammer.

SAFETY:

ALWAYS WEAR YOUR SAFETY GLASSES WHEN CHIPPING BRICKS OR BLOCKS.



**A USING A BRICK HAMMER
TO SPLIT BRICK**



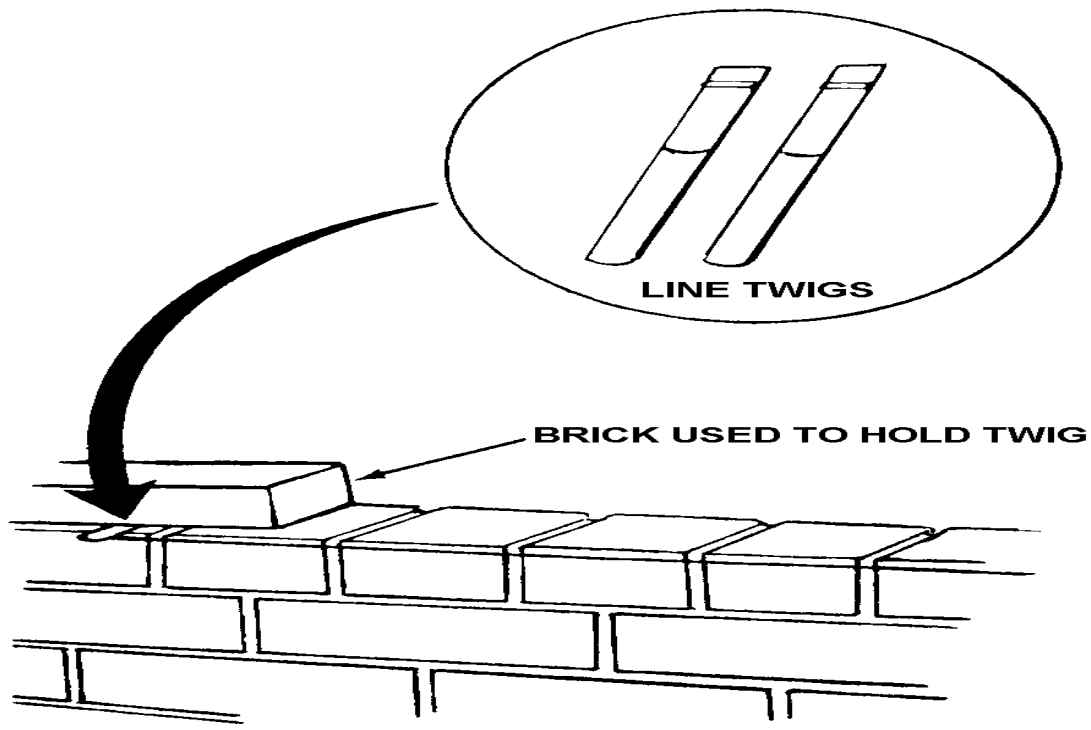
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B TRIMMING A SPLIT BRICK

Figure 4, Using a Brick Hammer

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- **Mason's line:** The mason's line keeps building walls in alignment during construction. Special jigs are available to hold the line tight between blocks. Figure 5 shows how to use a mason's line.



F14-5

Figure 5, Use of a Mason's line.

- **Floats:** Floats are used to prepare the surface of concrete for troweling. They are made from wood, aluminum, magnesium, cork, or molded rubber.
- **Brushes:** Brushes are produced in a variety of shapes and textures. They are used to remove mortar from masonry units after the wall has been constructed, to wash brick surfaces and for general cleaning.
- **Screed:** A screed is a straight edge or strike-off rod made of any straight piece of wood or metal that has sufficient rigidity. It's the first finishing tool used after the concrete is placed. It's used to strike off or screed the concrete surface to a proper level.

NOTE:

All masonry tools must be clean to perform properly. You must clean off your tools at the end of each day when they are used.

Metal hand cutting tools: Not all cutting in metal work is done by machine. There are several basic handtools that are used for cutting. These tools are very safe to use when in good condition, sharp, and properly handled. There are many uses for hand snips and shears such as cutting light gauge sheet metal. You should never use snips or shears to cut wire or rods. They are designed to cut sheet metal only. Some common handtools are.

- **Straight snips (See Figure 6):** Straight snips are designed to cut straight or long curved lines. They are available with right hand cut for right-handed people, and left hand cut for left-handed people. Straight snips have a cutting capacity of 20-gauge mild steel (fig 14-6).

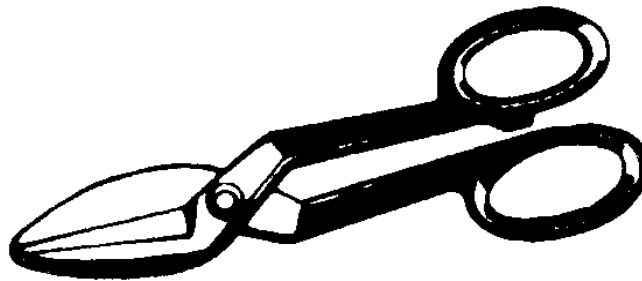


Figure 6, Straight snips.

- **Aviation snips:** The aviation snips that you will be using are shown in Figure 7. They are available in left or right hand cut. This means two pairs of snips are required, one for cutting to the left and one for cutting to the right. It does not mean they are made for left and right-handed people, as in the case of straight snips. The blades of aviation snips are designed to cut small holes and irregular outlines in heat-treated aluminum alloy or stainless steel. The handles are of the compound lever type and can cut mild steel as thick as 16-gauge. You will find these snips very useful in the field for cutting any shape of hole in ducts, panels, and similar jobs. They are usually color coded in keeping with industry standards. Green cuts to the right. Red cuts to the left. Yellow cuts straight.

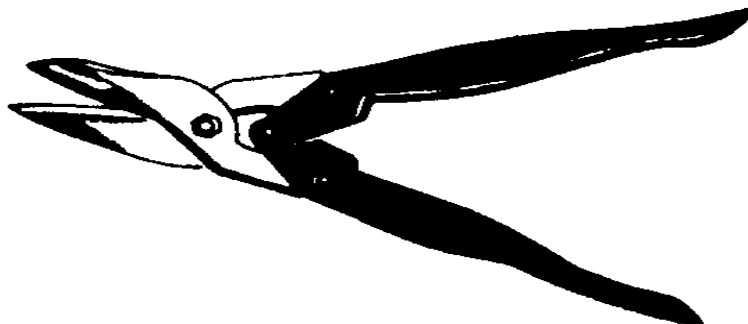


Figure 7, Aviation snips.

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- **Chisels:** These are used to cut cold metal, and for this reason are called “cold” chisels. The work to be cut will determine how the chisel should be sharpened. A chisel with a slightly curved cutting edge works better when cutting on a flat plate. If it is to be used to shear metal held in a vise, it will work best if the cutting edge is straight. The curved edge will help prevent the chisel from cutting unwanted grooves in the surrounding metal when shearing rivet heads.

SAFETY:

FLYING CHIPS ARE DANGEROUS. YOU SHOULD WEAR SAFETY GOGGLES AND ERECT A SHIELD WHEN USING A CHISEL TO PROTECT YOURSELF AND THE PEOPLE WORKING NEAR YOU. HOLD THE CHISEL IN SUCH A MANNER, THAT SHOULD YOU MISS A STROKE WITH THE HAMMER, IT WILL NOT STRIKE AND INJURE YOUR HAND. REMOVE ANY CHISEL HEAD MUSHROOMING BY GRINDING BEFORE IT BECOMES DANGEROUS. EDGES CUT WITH THE CHISEL ARE SHARP AND CAN CAUSE BAD CUTS. REMOVE THESE EDGES BY GRINDING OR FILING.

Punches: Several types of punches are used in metal work, including those for marking metal before drilling, removing pins, aligning holes, and for piercing holes. Some of the common ones include:

- **Hand punches:** Many types of hand punches are used in sheet metal shops. The punches in Figure 8 are used more often than others. The heads and points should be kept in good condition, same as for chisels. The center punch makes a small depression in metal before drilling or punching, thus keeping the twist drill from “walking” as you drill. You use the prick punch to establish location points in laying out patterns on sheet metal. The starting punch is tapered for strength, has a blunt tip, and is used to loosen tight-fitting pins for the removal from a hole.
 - a. A Drift or, taper punch, is used to loosen tight-fitting pins, although its slender shape is not as strong as the starting punch. It’s often used to align holes in two pieces of metal before installing screws, bolts or rivets. The pin punch has no taper, it’s used to drive out rivets that have heads drilled off and to drive pins out of holes too deep for the starting punch or drift punch. The starting punch, drift punch, and pin punch are used with suitable back-up material to pierce holes in metal.

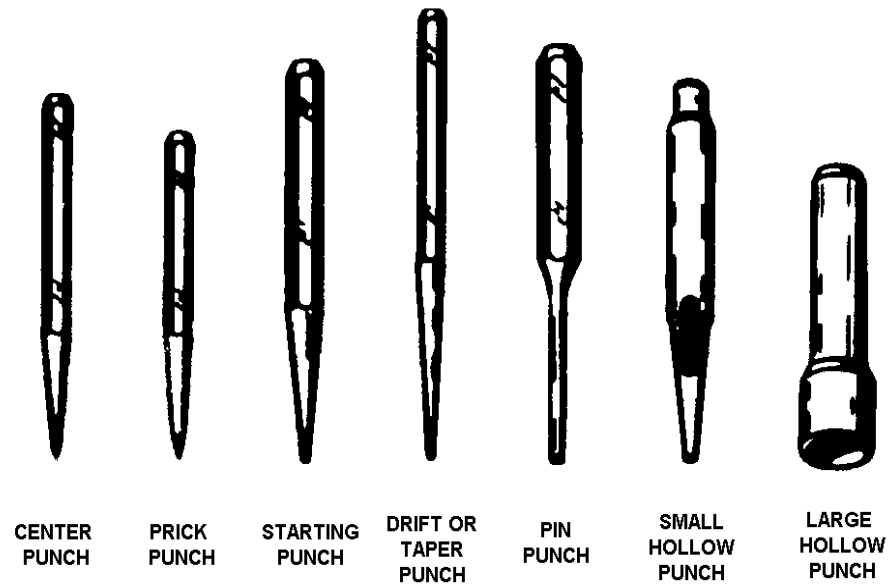


Figure 8, Hand Punches.

- b. The Whitney punch and the iron hand-lever punch have interchangeable dies for piercing holes in metal. The Whitney punch, as shown in Figure 9 is used to punch light-gauge metal and is available with dies ranging in size from 1/16 to 3/32 inch. When you're making holes in exact locations, set the centering point in the center punch mark. The iron hand-lever punch is like the Whitney punch, except it has longer handles and is available with dies ranging in size from 3/32 to 1/2 inch. Both punches have short throats and are used when the hole locations are near the edge of the material. Both punches pierce holes much faster in light-gauge metal than twist drills. When you change punches and dies, be sure to match the sizes. A punch that is too large for a die damages the cutting edges. A punch that is too small pierces the hole but dimples the materials.

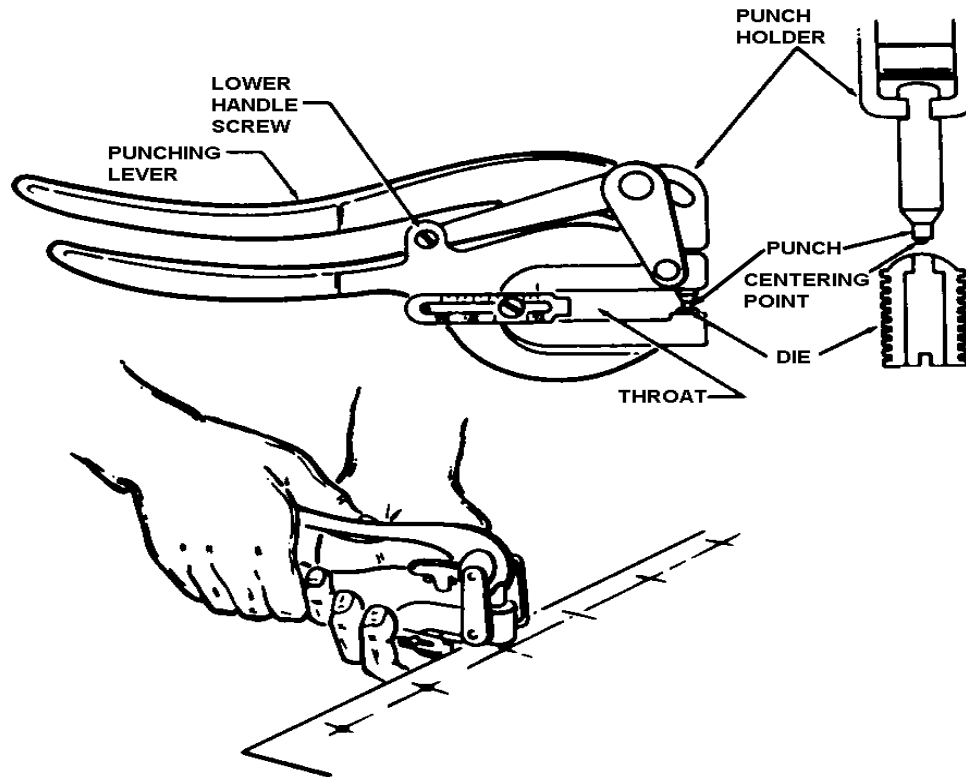


Figure 9, Whitney Punch.

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

Taps and Dies: There are many different types of taps and dies, as explained below.

- **Taps:** A tap is used to cut threads on the inside of a round hole. It's a hardened tool steel screw with flutes, or grooves, cut lengthwise across the threads to form cutting edges. The tap is screwed into the hole, and the cutting faces formed by the grooves cut the threads into the wall of the hole. You screw a tap into the hole by using a special wrench to give you the necessary leverage. Common types of hand taps are the taper, plug and bottom taps, as shown in Figure 10. The taper tap is tapered at the end 7 to 9 threads, to help start the tap in the hole. It's used when the hole goes all the way through the work. The plug tap is also tapered, but only for 2 1/2 to 5 threads. After you start the thread with the taper tap, use a plug tap to cut to the maximum length. You may also use a plug tap when one end of the hole is closed. The bottoming tap has only one thread on the end that is chamfered or beveled. Use this tap when you need to cut full threads all the way to the bottom of a blind hole. Before a tap is used, the hole must be drilled to the correct tap drill size. The tap drill size is the size of the drill that should be used to leave the proper amount of material in the hole for the tap to cut a thread. The tap drill, which is always smaller than the tap, leaves enough material in the hole for the tap to produce 75 percent of a full thread.

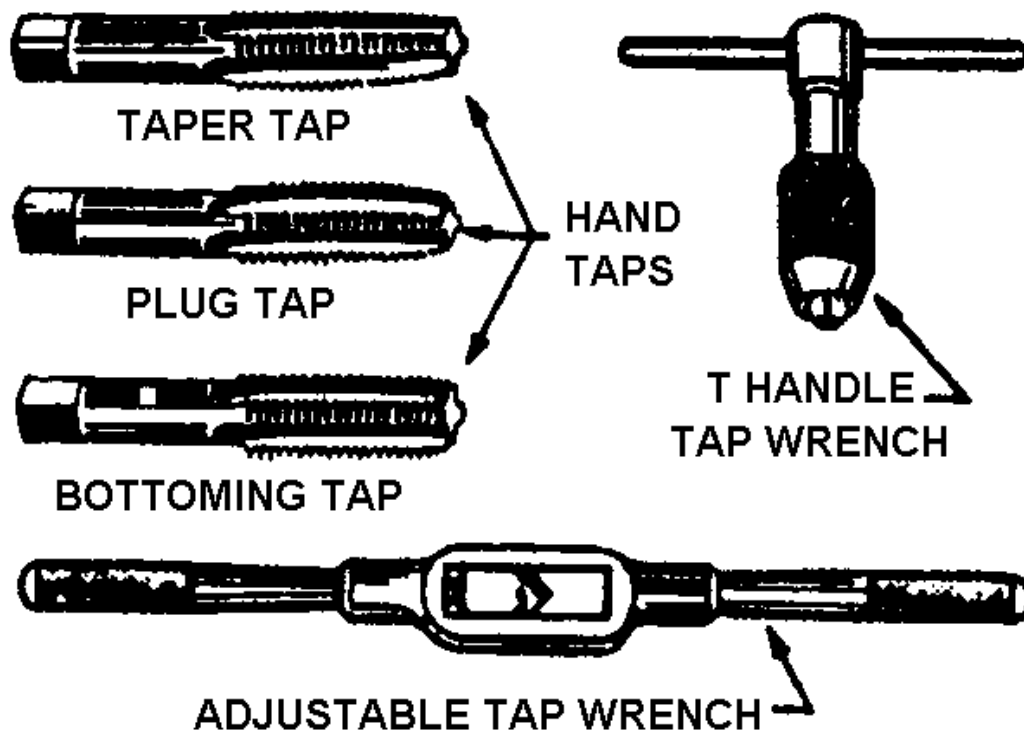


Figure 10, Hand Taps and Tap Wrenches.

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

- **Dies:** Dies are used to cut external threads. They are formed in hardened discs, of a uniform size, that can be clamped in a leverage-producing device called a diestock. Figure 11 shows the complete assembly ready for use. Using dies is like tapping. Hold the work firmly in a vise and file off any burr on the end of the piece to be threaded. To start the thread, place the large opening of the die over the work and press down firmly while turning clockwise. When the die teeth catch and begin to cut, apply a few drops of cutting oil to the end of the work and continue turning, as if tapping. A part turn forward, followed by a part turn backward, until the thread is cut to the right length. It's important to lubricate the work frequently. After the die teeth have taken hold, remove the feed pressure and let the threads pull the die onto the work at the proper rate.

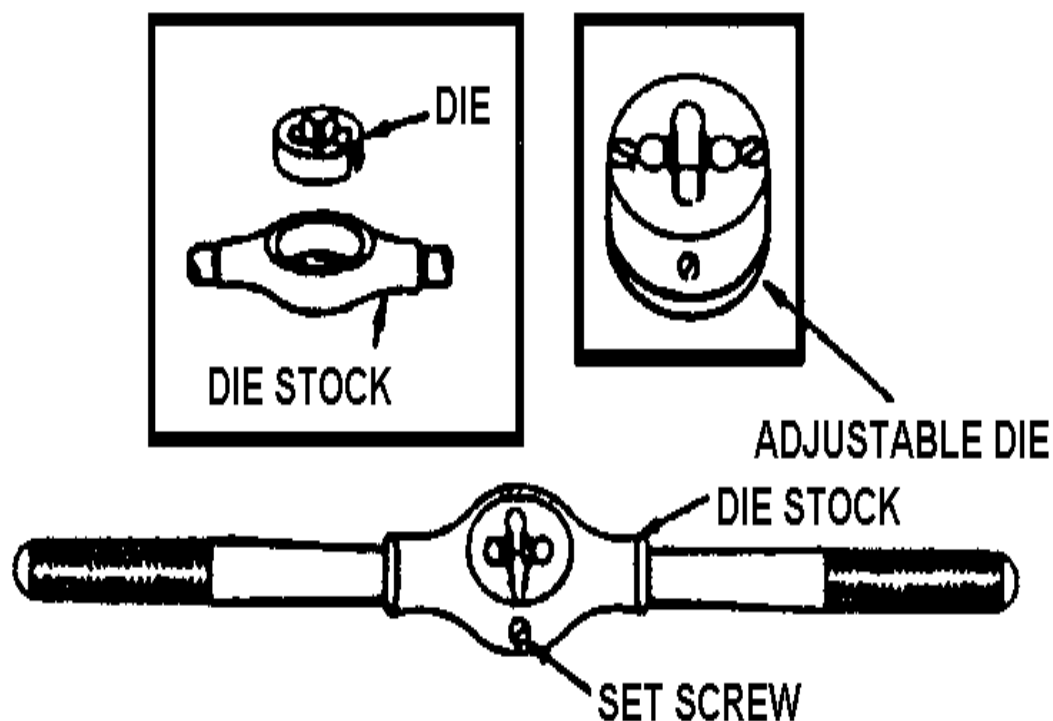


Figure 11, Dies and Die Stock.

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

Review Questions for Hand Tools

Question	Answer
1. What type of saw is used to make cuts parallel to the wood grain?	a. Nest of saws b. Backsaw c. Ripsaw d. Crosscut saw
2. What type of saw has a thin blade that is reinforced with a metal strip along the top edge?	a. Nest of saws b. Backsaw c. Ripsaw d. Crosscut saw
3. What determines the size of a hammer?	a. The length of the handle b. The weight of the handle c. The length of the head d. The weight of the head
4. What are the two common types of claw hammers?	a. Curved and straight b. Curved and drywall c. Ripping and straight d. Ripping and sledge
5. What hammer is most useful when removing wood siding from an old building?	a. Curved claw hammer b. Sledgehammer c. Mallet hammer d. Straight claw hammer
6. What square is most commonly used during building layout and erection?	a. Bevel square b. Combination Square c. Framing square d. Try square
7. The ends of a board can easily be checked for square by using _____.	a. bevel square b. combination Square c. framing square d. try square
8. Which square can easily be used both to lay parallel lines and to lay out 45 degree and 90 degree lines?	a. Bevel square b. Combination Square c. Framing square d. Try square
9. What driving tool should you use to strike chisels when making deep cuts?	a. Curved claw b. Sledge c. Mallet d. Straight claw

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Review Questions for Hand Tools

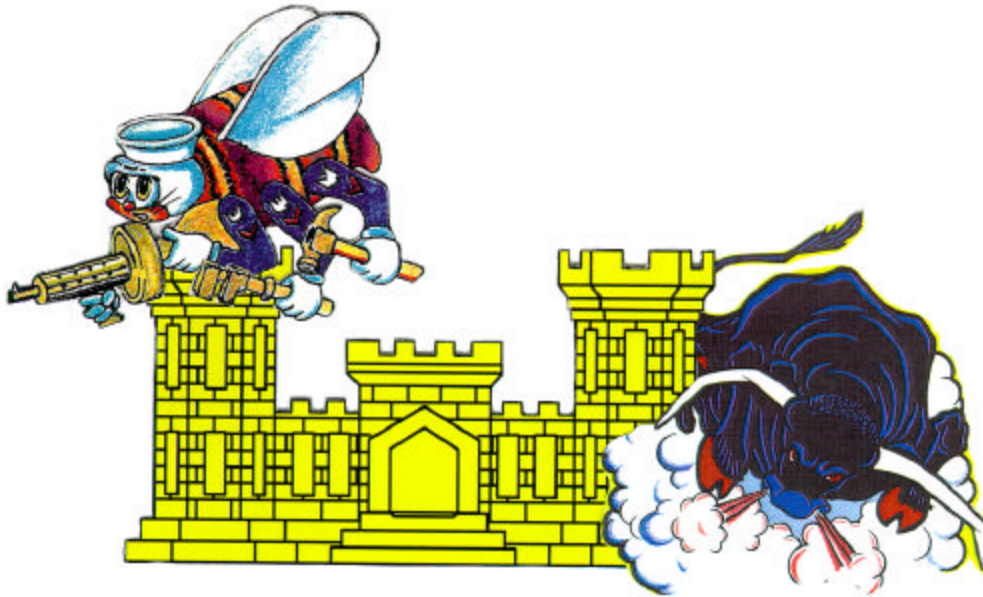
Question	Answer
10. What is used to hone the edges on tools?	a. Soapstone b. Oilstone c. Grinder d. File
11. Screwdriver sizes are specified by the _____.	a. length of the blade, from the ferrule to the tip b. length of the handle c. diameter of the shank d. overall length of the screwdriver
12. What tool is used to cut brick?	a. Brick hammer b. Brick set c. Cold chisel d. Brick chisel
13. What masonry tool is used first after concrete is placed?	a. Jitter bug b. Bull float c. Screed d. Cement trowel
14. What is the maximum cutting capacity of straight snips?	a. 18 gauge b. 20 gauge c. 22 gauge d. 24 gauge
15. Aviation snips with yellow handles are designed to cut _____.	a. left b. right c. straight d. circles
16. What are Prick Punches used for?	a. Mark metal before drilling b. Remove pins c. Aligning holes d. Establish location points
17. What are the three types of taps?	a. Taper, Plug, and Bottom b. Taper, Plug, and Fluted c. Taper, Fluted and Bottom d. Taper, Fluted and Grooved
18. What tap is used when the hole goes all the way through the work?	a. Taper b. Plug c. Bottom d. Fluted

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HANDTOOLS

Performance Checklist		
Step	Yes	No
1. Did the trainee use the handsaw properly?		
2. Did the trainee use the hammer properly?		
3. Did the trainee use the layout tools properly?		
4. Did the trainee use the planes properly?		
5. Did the trainee use the wood chisels properly?		
6. Did the trainee use the fastening tools properly?		
7. Did the trainee use the masonry tools properly?		
8. Did the trainee use the metal hand cutting tools properly?		
9. Did the trainee use the Whitney punch properly?		
10. Did the trainee use the tap and die set properly?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



USE

MODULE 14

AFQTP UNIT 1

CIRCULAR SAW (14.1.3.)

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

CIRCULAR SAW

Task Training Guide

STS Reference Number/Title:	14.1.3. Circular Saw
Training References:	<ul style="list-style-type: none">• AFQTP Video PIN# 613766 CIRCULAR SAW RECIPROCATING SAW PT 1 AND PT2• 3E351 CDCs• Modern Carpentry by Willis H. Wagner• NAVEDTRA 12520
Prerequisites:	<ul style="list-style-type: none">• Possess as a minimum 3E331 AFSC
Equipment/Tools Required:	<ul style="list-style-type: none">• Circular saw• Personal safety equipment• Saw horses or workbench• Straight edge or framing square• Extension cord• Some kind of lumber needing to be cut
Learning Objective:	<ul style="list-style-type: none">• Upon completing this section, you should be able to describe the procedures for operating a circular saw.
Samples of Behavior:	<ul style="list-style-type: none">• Trainee will be able to successfully and safely operate a circular saw.
Notes:	
<ul style="list-style-type: none">• Any safety violation is an automatic failure.	

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

CIRCULAR SAW

Background: In addition to using power shop tools, you will be required to operate different types of portable hand tools in the field. The portable electric circular saw is probably the most commonly used portable power tool.

To perform this task complete: Video, PIN # 613766, CIRCULAR SAW-RECIPROCATING SAW PT 1 and PT 2

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

Review Questions for Circular Saw

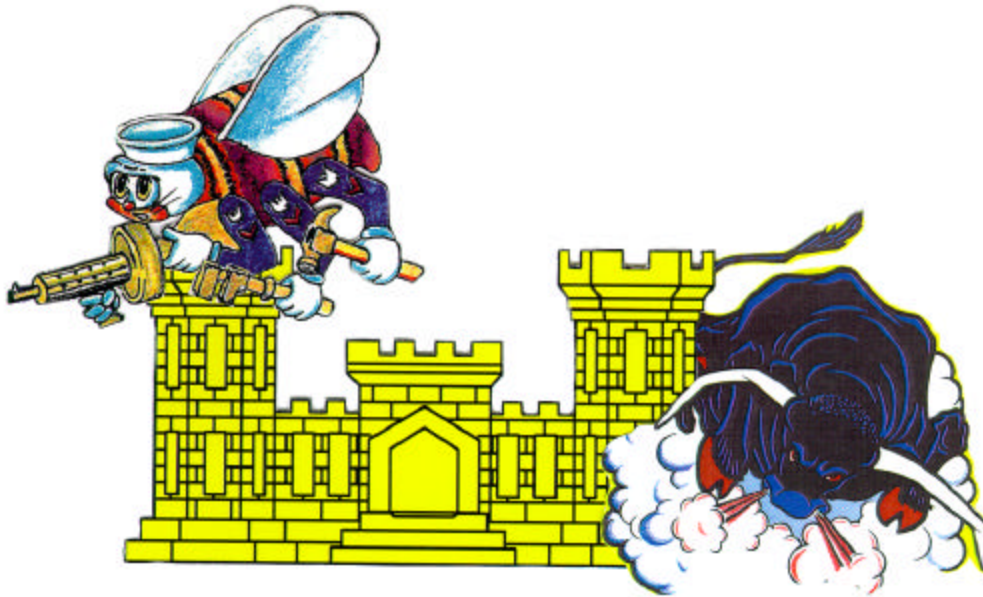
Question	Answer
1. The size of a circular saw is determined by what factor?	<ul style="list-style-type: none"> a. The size of the motor. b. The size of the smallest blade it uses. c. The size of the largest blade it uses. d. The size of the guard.
2. Which of the following types of blades is considered an all-purpose blade?	<ul style="list-style-type: none"> a. Abrasive. b. Crosscut. c. Rip. d. Combination.
3. Why should you make sure that the material you are going to cut with a circular saw is supported or fastened?	<ul style="list-style-type: none"> a. To keep from cutting into the sawhorse. b. So the base and angle adjustment will be right. c. So that it will not shift or move during the cutting operation d. To keep you from reaching under the material being cut.
4. Before any cutting operation you should_____.	<ul style="list-style-type: none"> a. Wear safety glasses. b. Keep all safety guards in position. c. Make all adjustments before turning on the power d. All of the above.
5. When cutting materials you should use which of the following procedures?	<ul style="list-style-type: none"> a. Hold the saw with one hand and place the other on the stock. b. Hold the saw with both hands firmly against the work. c. Hold the saw with both hands after removing the blade guard d. Hold the saw with both hands lightly against the work.
6. You should never clean up after yourself.	<ul style="list-style-type: none"> a. True. b. False.

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

CIRCULAR SAW

Performance Checklist		
Step	Yes	No
1. Did the trainee gather the required tools and equipment?		
2. Did the trainee use all safety precautions?		
3. Did the trainee prepare the circular saw for operation?		
4. Did the trainee properly operate the circular saw?		
5. Did the trainee clean up all cutting debris?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and the trainer.



USE

MODULE 14

AFQTP UNIT 1

ELECTRIC DRILL (14.1.4.)

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

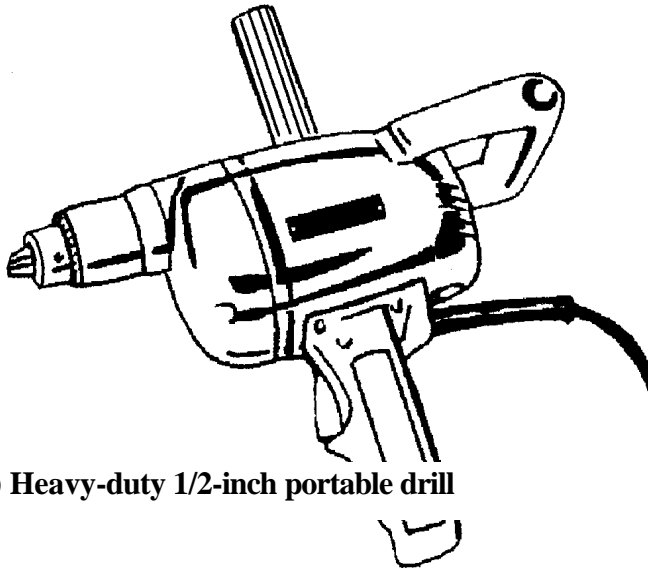
ELECTRIC DRILL***Task Training Guide***

STS Reference Number/Title:	14.1.4. Electric drill
Training References:	<ul style="list-style-type: none">• AFQTP Video PIN # 613767 ELECTRIC DRILL – ROTARY HAMMER DRILL• 3E351 CDCs• Modern Carpentry by Willis H. Wagner• NAVEDTRA 12521
Prerequisites:	<ul style="list-style-type: none">• Possess as a minimum a E331 AFSC
Equipment/Tools Required:	<ul style="list-style-type: none">• Portable electric drill• Drill index.
Learning Objective:	<ul style="list-style-type: none">• Upon completing this section, trainee should be able to describe the procedures to safely operate a portable electric drill.
Samples of Behavior:	<ul style="list-style-type: none">• Trainee will be able to successfully and safely use a portable electric drill.
Notes:	
<ul style="list-style-type: none">• Any safety violation is an automatic failure.	

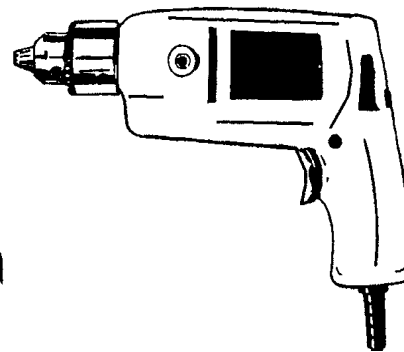
Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

ELECTRIC DRILL

Background: Portable electric drills have generally replaced hand tools for drilling holes because they are faster and more accurate. With variable-speed controls and special clutch-drive chucks, they can also be used as electric screwdrivers. More specialized power-driven screwdrivers are also available. These have greatly increased the efficiency of many fastening operations in construction work. The two basic designs for portable electric drills (Figure 1) are the spade design for heavy-duty construction (A) and the pistol-grip design for lighter work (B). Sizes of power drills are based on the diameter of the largest drill shank that will fit into the chuck of the drill.



(A) Heavy-duty 1/2-inch portable drill



(B) Light-duty 1/2-inch portable drill

To Perform This Task complete: Video, PIN # 613767, Electric Drill – Rotary Hammer Drill

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

**Review Questions
for
Electric Drill**

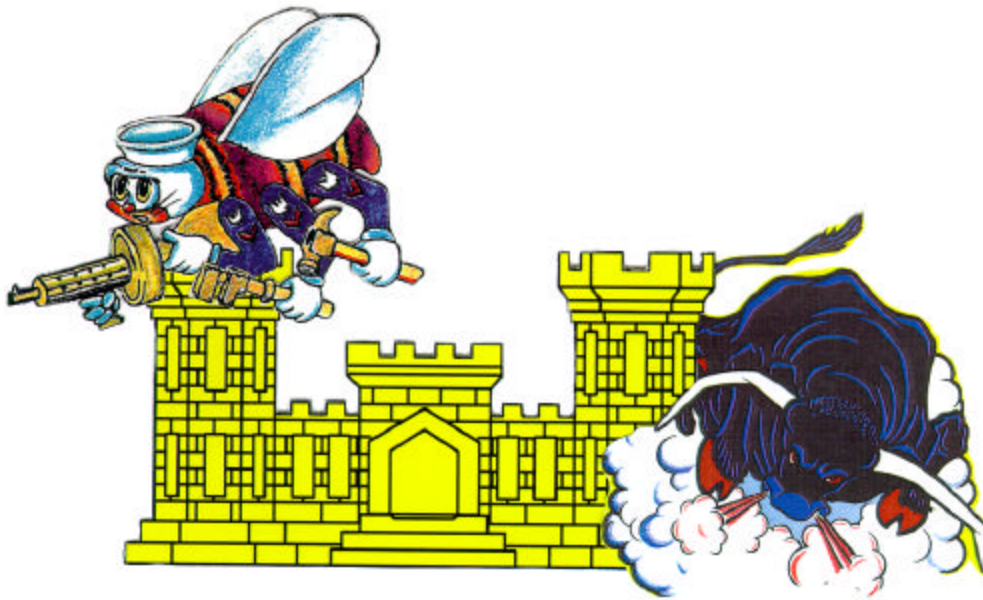
Question	Answer
1. What are the two basic designs for portable electric drills?	a. Spade and pistol grip. b. Variable and cordless. c. Spade and cordless. d. Pistol and variable.
2. At what angle to the work should you always hold the drill?	a. 45 degrees. b. 60 degrees. c. 90 degrees. d. 180 degrees.
3. Why should you withdraw the drill when drilling deep holes?	a. To avoid binding the bit. b. To remove the cuttings. c. To keep the drill aligned with the hole. d. To feed the drill into the work.
4. What is the right angle drill used for?	a. Variable drilling operations. b. Plumbing and electrical work. c. Large hole boring bits. d. Used as electric screwdrivers.
5. How are electric drill sizes determined?	a. By the size of the motor. b. By the Rpm's it produces. c. By the type of design. d. By the chuck capacity.

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

ELECTRIC DRILL

Performance Checklist		
Step	Yes	No
1. Did the trainee gather the required tools and equipment?		
2. Did the trainee adhere to all safety guidelines?		
3. Did the trainee follow the proper operating procedures?		
4. Did the trainee demonstrate proper care and maintenance?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and the trainer.



USE

MODULE 14

AFQTP UNIT 1

RECIPROCATING SAW (14.1.5.)

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

RECIPROCATING SAW***Task Training Guide***

STS Reference Number/Title:	<ul style="list-style-type: none"> 14.1.5. Reciprocating saw
Training References:	<ul style="list-style-type: none"> AFQTP Video PIN # 613766 Circular Saw- Reciprocating Saw, PT 1 and PT 2 3E351 CDCs Modern Carpentry by Willis H. Wagner NAVEDTRA 12520
Prerequisites:	<ul style="list-style-type: none"> Possess as a minimum a 3E331 AFSC
Equipment/Tools Required:	<ul style="list-style-type: none"> Reciprocating saw Personal safety equipment Blade assortment Material to be cut
Learning Objective:	<ul style="list-style-type: none"> Upon completing this section, you should be able to describe the procedures for operating and maintaining a reciprocating saw.
Samples of Behavior:	<ul style="list-style-type: none"> Trainee will be able to successfully and safely operate a reciprocating saw.
Notes:	
<ul style="list-style-type: none"> Any safety violation is an automatic failure. 	

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

RECIPROCATING SAW

Background: The reciprocating saw, also called by a popular trade name “Saw-zall”, is useful for a wide range of light and heavy work. Carpenters, cabinetmakers, electricians, and home craftspeople use it. The proper and safe use of this saw will allow the craftsman to perform many tasks quicker and easier.

To Perform This Task complete: Video, PIN # 613766, Circular Saw- Reciprocating Saw, Pt 1 and PT 2

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

Review Questions for Reciprocating Saw

Question	Answer
1. What is the common trade name used to describe reciprocating saws?	<ul style="list-style-type: none"> a. Jig saw. b. Saber saw. c. Skill saw. d. Saw-zall.
2. What materials are reciprocating saw blades made of?	<ul style="list-style-type: none"> a. High-speed steel or carbon steel. b. High-speed steel or stainless steel. c. Carbon steel or stainless steel. d. Tool steel or high speed steel.
3. You must become familiar with _____ when dealing with power tools?	<ul style="list-style-type: none"> a. The way it works. b. The way it looks. c. The correct way to use it. d. Both a. and c.
4. What must you ensure when cutting through a wall?	<ul style="list-style-type: none"> a. That all safety guards are in position. b. That you are wearing safety glasses. c. That all electrical wires are clear. d. All of the above.
5. To start a cut, you should _____.	<ul style="list-style-type: none"> a. Start the motor and move the blade into the material. b. Start the motor while the blade is in contact with the material. c. Force the blade into the material to eliminate kick back. d. Use a dull blade to start the cut and a sharp one to finish it.
6. How should you start an internal cut?	<ul style="list-style-type: none"> a. By plunge cutting. b. Use a hammer to make a hole. c. Use an internal cut saw. d. Drill a starter hole in the waste stock.
7. Why should you check clearance underneath your work before cutting?	<ul style="list-style-type: none"> a. To see if you're starting in the proper place. b. To eliminate cutting sawhorses or other supports. c. To ensure you saw debris has a place to go. d. So you don't twist your saw blades.
8. Metal surfaces should be wiped with	<ul style="list-style-type: none"> a. Light oil.

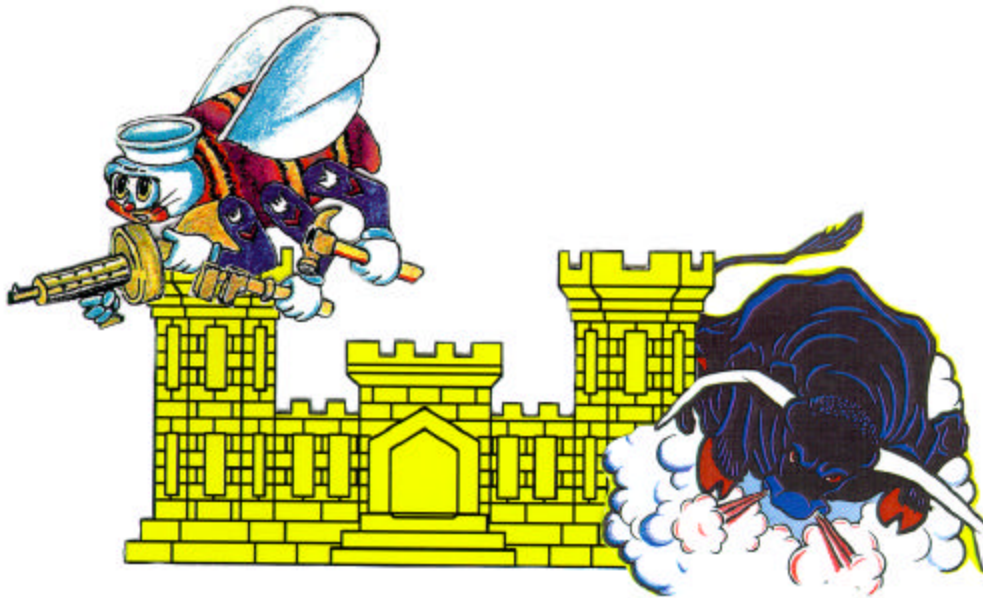
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Question	Answer
_____.	b. Gear oil. c. Furniture polish. d. Both a and c.

RECIPROCATING SAW

Performance Checklist		
Step	Yes	No
1. Did the trainee follow all safety rules?		
2. Did the trainee use proper methods to start cuts?		
3. Did the trainee know procedures for setting up the saw?		
4. Did the trainee perform proper care and maintenance of saw?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and the trainer.



USE

MODULE 14

AFQTP UNIT 1

POWER MITER SAW (14.1.6.)

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

POWER MITER SAW***Task Training Guide***

STS Reference Number/Title:	14.1.6. Power miter saw
Training References:	<ul style="list-style-type: none">• AFQTP Video PIN # 613768, Compound Miter Saw• Modern Carpentry by Willis H. Wagner• 3E351 CDCs
Prerequisites:	<ul style="list-style-type: none">• Possess as a minimum a 3E331 AFSC
Equipment/Tools Required:	<ul style="list-style-type: none">• Power miter saw• Personal safety equipment
Learning Objective:	<ul style="list-style-type: none">• Upon completing this section, you should be able to describe the procedures for safely operating a power miter saw.
Samples of Behavior:	<ul style="list-style-type: none">• Trainee will be able to successfully and safely make accurate cuts using a power miter saw.
Notes:	
<ul style="list-style-type: none">• Any safety violation is an automatic failure.	

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

POWER MITER SAW

Background: Special saws have been developed for certain uses when working with wood construction. The power miter saw can be used for making accurate cross cuts and mitering. The motor and blade of the power miter saw are supported on a pivot. A scale on the saw is used to set the angle for the desired cut. Forty-five degree cuts can be made on either side of the saw blade. Compound angles can also be cut by adjusting the head of the unit if so equipped.

To Perform This Task complete: Video, PIN # 613768 Compound Miter Saw

SAFETY:

BE SURE THE SAW IS SECURELY LOCKED AT THE ANGLE OF THE CUT.

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

**Review Questions
for
Power Miter Saw**

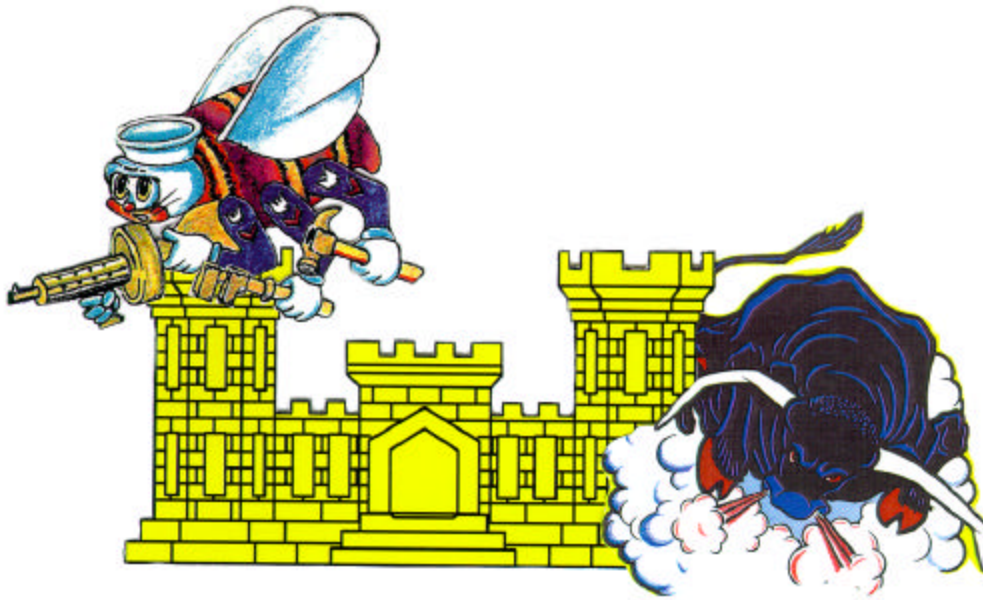
Question	Answer
1. A _____ on the power miter saw is used to set the angle to the desired cut.	a. Control knob. b. Clamp. c. Gauge. d. Scale.
2. _____ cuts can be made on either side of the saw blade.	a. 22 1/2 degree. b. 45 degree. c. 60 degree. d. 90 degree.
3. To swivel the saw blade on a power miter saw you must first _____.	a. Loosen the adjusting knob. b. Loosen the arbor nut. c. Unplug the power cord. d. Loosen the fence clamp.
4. You may make freehand cuts using a power miter saw.	a. True. b. False.
5. Start the saw before the blade contacts the _____.	a. Fence. b. Guard. c. Stock. d. Base.

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

POWER MITER SAW

Performance Checklist		
Step	Yes	No
1. Did the trainee make the proper adjustments to the saw?		
2. Did the trainee use the proper procedures when operating the saw?		
3. Did the trainee exercise safety when operating the saw?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and the trainer.



USE

MODULE 14

AFQTP UNIT 1

ROTARY HAMMER (14.1.8.)

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

ROTARY HAMMER***Task Training Guide***

STS Reference Number/Title:	14.1.8. Rotary hammer
Training References:	<ul style="list-style-type: none"> • AFQTP Video PIN# 613767 ELECTRIC DRILL – ROTARY HAMMER DRILL • 3E351 CDCs • Modern Carpentry by Willis H. Wagner
Prerequisites:	<ul style="list-style-type: none"> • Possess as a minimum a 3E331 AFSC
Equipment/Materials Required:	<ul style="list-style-type: none"> • Rotary hammer with bits • Personal safety equipment • Concrete surface • Extension cord • Fasteners
Learning Objective:	<ul style="list-style-type: none"> • Upon completing this section, trainee should be able to operate a rotary hammer and describe its uses.
Samples of Behavior:	<ul style="list-style-type: none"> • Trainee will be able to successfully, safely, and accurately drill holes in masonry using a rotary hammer.
Notes:	
<ul style="list-style-type: none"> • Any safety violation is an automatic failure. 	

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ROTARY HAMMER

Background: Portable electric rotary hammers are available in a wide variety of sizes and shapes. They are used regularly in today's construction to drill holes in all forms of masonry. The rotary hammer's chucks are available in three different types (Spline, SDS, and SDS plus). Bits are manufactured with shanks, to fit these different chucks in sizes ranging from 1/4 to 1 inch in diameter. There is a multitude of available lengths and designs to meet any requirement. Some rotary hammers are equipped with a switch to disengage the hammer action. This feature makes starting a hole much easier. The switch may also disengage the drill action to use the rotary hammer for chiseling, provided a chisel bit is installed in the rotary hammer. Rotary hammers are also available with variable speed controls, and reversible action. When drilling with rotary hammers you must first determine the diameter and length of the bit required to complete the job. If the hole is not to be drilled completely through the masonry surface, place a piece of tape around the bit at the point of desired depth and proceed drilling the hole until you reach the tape. Many models are equipped with a depth gauge to accomplish this. Rotary hammers generally require little or no force to efficiently drill. They will however require force when operated horizontally or vertically overhead. Be sure to grasp the rotary hammer firmly when operating and keep it well aligned. Rotary hammers are heavy-duty drilling tools and generate a great deal of torque.

SAFETY:

IF THIS TOOL BINDS WHILE OPERATED, SERIOUS INJURIES COULD OCCUR. TO HELP MINIMIZE THE CHANCE OF THE BIT BINDING YOU SHOULD PARTIALLY WITHDRAW THE BIT FROM THE HOLE OCCASIONALLY WHILE DRILLING. THIS IS ESPECIALLY HELPFUL WHEN DRILLING DEEP HOLES AS IT HELPS EXPEL DUST PARTICLES FROM THE HOLE.

To Perform This Task complete: Video, PIN # 613767, Electric Drill – Rotary Hammer Drill

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Review Questions for Rotary Hammer

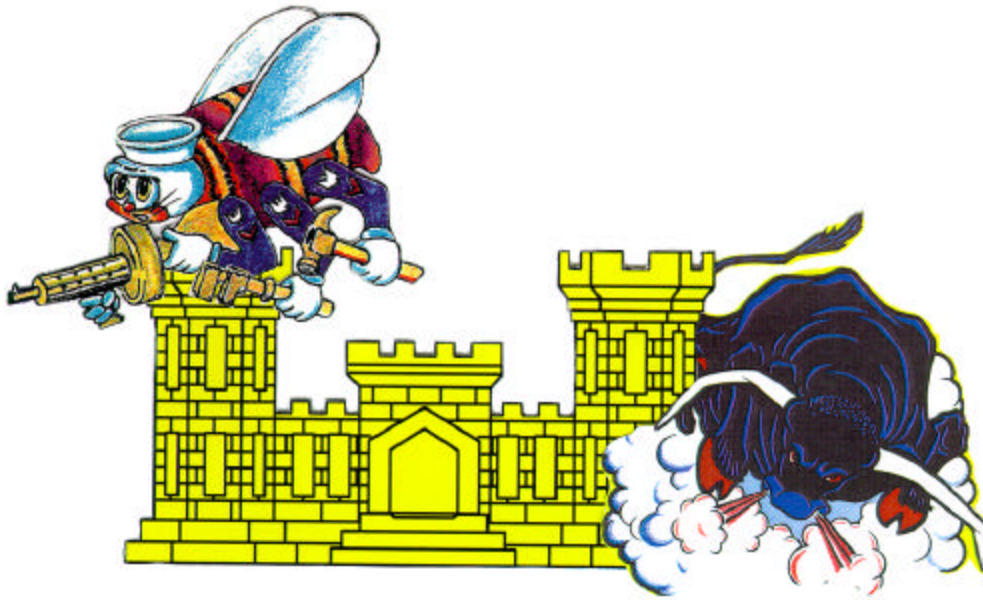
Question	Answer
1. Common sizes of masonry bits range from _____.	a. 1/8 to 1 inch diameter. b. 1/4 to 1 inch diameter. c. 3/8 to 1 inch diameter. d. 1/2 to 1 inch diameter.
2. When drilling with a rotary hammer you must first determine _____.	a. The diameter and length of the bit required. b. The diameter and the hardness of the bit required. c. The depth and length required. d. The depth and hardness required.
3. If a hole is not to be drilled completely through the masonry surface you can control the depth by adjusting _____.	a. The hammer action. b. The depth gauge. c. The force d. The reverse switch.
4. Rotary hammers usually require little or no force to efficiently drill.	a. True. b. False.
5. Rotary hammers are usually a heavy-duty drilling tool and generate a great deal of _____.	a. Electricity. b. Dust. c. Heat. d. Torque.
6. To help minimize the chance of the bit binding during operation you should _____.	a. Fully withdraw the bit from the hole while drilling. b. Partially withdraw the bit from the hole while drilling. c. Place a piece of tape around the bit. d. Adjust the depth gauge.
7. To start drilling a hole it may be easier if you _____.	a. Use a star drill to start the hole. b. Reverse the drill motor. c. Disengage the hammer action. d. Disengage the rotary action.

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ROTARY HAMMER

Performance Checklist		
Step	Yes	No
1. Did the trainee correctly determine the diameter and depth of hole?		
2. Did the trainee gather the required tools, equipment and materials?		
3. Did the trainee accurately mark the location of the hole to be drilled?		
4. Did the trainee set up the equipment correctly?		
5. Did the trainee drill the hole correctly?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and the trainer.



USE

MODULE 14

AFQTP UNIT 1

HAND GRINDER (14.1.9.)

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HAND GRINDER***Task Training Guide***

STS Reference Number/Title:	14.1.9. Hand grinder
Training References:	<ul style="list-style-type: none"> • AFQTP Video PIN# 613765 HAND GRINDER • Modern Metalworking by John R. Walker • NAVEDTRA 12521 • 3E351 CDC's
Prerequisites:	<ul style="list-style-type: none"> • Possess as a minimum a 3E331 AFSC
Equipment/Tools Required:	<ul style="list-style-type: none"> • 7 inch portable electric hand grinder • Personal safety equipment • 7 inch grinding disk • Mild steel surface
Learning Objective:	<ul style="list-style-type: none"> • Upon completing this section, the trainee should be able to determine the proper use and maintenance requirements for the portable electric hand grinder.
Samples of Behavior:	<ul style="list-style-type: none"> • Trainee will be able to successfully and safely operate the portable electric hand grinder.
Notes:	
<ul style="list-style-type: none"> • Any safety violation is an automatic failure. 	

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HAND GRINDER

Background: The portable electric hand grinder is used extensively in today's welding field. It may be used in other areas of the Structural career field for a broad range of cutting and grinding tasks. Brushes and wheels are very helpful for removing corrosion from metals. Disks are available in different designs. Some are used on edge for cutting or removing metal in large amounts from crevices. Others are designed for surface grinding in flat positions. Be sure to choose the correct disk for the job at hand.

To Perform This Task complete: Video, PIN #613765, HAND GRINDER

SAFETY:

NEVER WEAR LOOSE CLOTHING WHEN OPERATING A HAND GRINDER. CLOTHING CAN BECOME ENTANGLED IN THE ROTATING DISK, BRUSH, OR WHEEL AND CAUSE INJURY TO THE OPERATOR. ALWAYS WEAR EYE, EAR AND FACE PROTECTION AS WELL AS GLOVES. PARTICLES THROWN FROM THIS POWER TOOL ARE OFTEN HOT, SHARP, AND TRAVELING AT HIGH RATES OF SPEED.

SAFETY:

NEVER OPERATE A HAND GRINDER WITHOUT A GUARD, OR AN EXTRA HANDLE IF EQUIPPED WITH ONE. GRASP THE HAND GRINDER FIRMLY AND BE AWARE OF ITS DIRECTION OF ROTATION AS YOU CONTACT THE SURFACE TO BE GROUND.

SAFETY:

NEVER USE THIS TOOL IN A POSITION OR MANNER THAT WILL CAUSE IT TO PULL OR KICK OUT IN YOUR DIRECTION. BE CAREFUL NOT TO BIND THE DISK AS THIS COULD CAUSE IT TO BREAK, THROWING DEBRIS INTO THE AIR.

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Review Questions for Hand Grinder

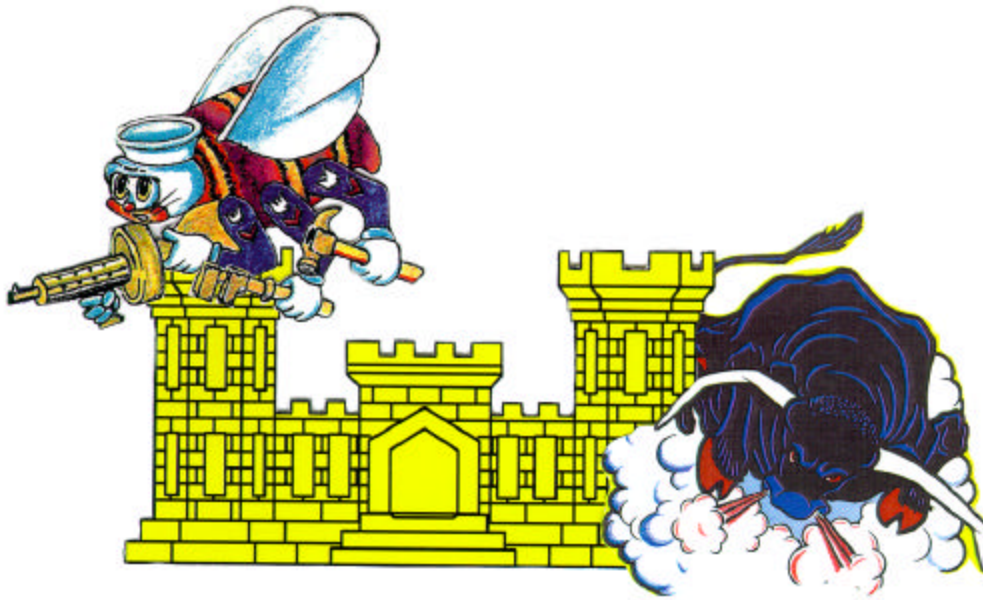
Question	Answer
1. The different sizes of the portable electric hand grinder indicate what?	<ul style="list-style-type: none"> a. Gear diameter. b. Gear case width. c. Cup brush diameter. d. Abrasive disk diameter
2. Thicknesses of grinder disks commonly range between?	<ul style="list-style-type: none"> a. 1/16 and 3/16 inch. b. 1/16 and 1/4 inch. c. 1/8 and 3/16 inch. d. 1/8 and 1/4 inch
3. Never grind non-ferrous metals.	<ul style="list-style-type: none"> a. True. b. False.
4. Cup brushes and wire buffing wheels are very helpful for _____.	<ul style="list-style-type: none"> a. Removing a lot of steel in a hurry. b. Removing paint from concrete floors. c. Removing corrosion from metals d. Shining wood surfaces.
5. To keep the arbor from turning while placing a disk on the hand grinder you should _____.	<ul style="list-style-type: none"> a. Unplug the power cord. b. Depress the power switch. c. Release the arbor-locking button. d. Depress the arbor-locking button.
6. Hand grinders generate a lot of dust and particles from _____.	<ul style="list-style-type: none"> a. Brass and the abrasive disk. b. Metal and the abrasive disk. c. Abrasive disk and lubricant. d. Metal and lubricant.
7. A damaged power cord must be _____.	<ul style="list-style-type: none"> a. Taped immediately. b. Cut and spliced together. c. Cut regardless of length and wire in new plug. d. Replaced immediately.

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HAND GRINDER

Performance Checklist		
Step	Yes	No
1. Did the trainee gather the required tools and equipment?		
2. Did the trainee follow the correct sequence and procedures for mounting disk on hand grinder?		
3. Did the trainee safely and successfully display ability to operate the hand grinder?		
4. Did the trainee describe and demonstrate the ability to maintain hand grinders and their attachments?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and the trainer.



TOOLS AND EQUIPMENT

MODULE 14

AFQTP UNIT 3

ERECT SCAFFOLDS AND LADDERS 14.3.)

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ERECT SCAFFOLDS AND LADDERS***Task Training Guide***

STS Reference Number/Title:	14.3. Erect Scaffolds and Ladders
Training References:	<ul style="list-style-type: none"> • 3E351 CDCs • Modern Carpentry R.T. Miller • Williams Learning Network Interactive Maintenance Training Program CD-ROM, <i>Rigging Ladders and Scaffolds</i>
Prerequisites:	<ul style="list-style-type: none"> • Possess, as a minimum, 3E331 AFSC
Equipment/Tools/Materials Required:	<ul style="list-style-type: none"> • General 3E3X1 tool kit • Personal safety equipment • Scaffolding • Extension ladder • Step ladder
Learning Objective:	<ul style="list-style-type: none"> • The trainee should be able to describe the procedures for erecting scaffolding and ladders.
Samples of Behavior:	<ul style="list-style-type: none"> • Trainee will be able to successfully and safely erect scaffolding and ladders. • Trainee will be able to inspect and adjust the operation of scaffolds and ladders.
Notes:	
<ul style="list-style-type: none"> • Due to the size and weight of scaffold sections and extension ladders, trainee may need help to setup and assemble these items. • Any safety violation is an automatic failure. • Trainee is encouraged to use the William Learning Network CD-ROM. See your Unit Training manager for this program. 	

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ERECT SCAFFOLDS AND LADDERS

Background: In your job you might have to work above ground on ladders, scaffolds and mobile work platforms. In order to work safely, you need to know the safety procedures for working at heights.

Scaffolding: There are several types of scaffolding used by carpenters. Scaffolding makes a Structural journeyman's work easier by providing a place for their materials and tools at a convenient height. Much of a mason's work is performed on scaffolding of one kind or another.

SAFETY:

THE THREE MAIN SOURCES OF INJURY ASSOCIATED WITH SCAFFOLDING ARE:

- **FALLING FROM THE SCAFFOLD.**
- **BEING STRUCK BY TOOLS OR MATERIALS FALLING FROM THE SCAFFOLD.**
- **FAULTY SCAFFOLDING.**

Scaffolding must be designed and erected properly to support the load it is expected to carry. Sectional steel scaffolding should be able to support four times the anticipated load of individuals and materials. The platform of the aluminum stairway scaffold is designed to carry a maximum load of 750 pounds.

The next few paragraphs discuss some safety precautions for the scaffold horse, sectional steel scaffold, aluminum stairway scaffold, planking and rolling scaffolding. They are not all-inclusive and aren't intended to replace other safety measures.

Scaffold horses: Even though you're not very high above the ground when you work from a scaffold horse, you are still in danger. Here are several precautions you should take to prevent serious injury to yourself or others:

- Always inspect the scaffold horses for split boards, loose knots, and loose nails.
- Set the scaffold horses on firm, even footing for each leg.
- Test scaffold boards by setting them on blocks close to the ground and jumping on them.
- Never use a scaffold board less than 1-1/2 x 9-1/2 inches (2 x 10).
- Place the boards close together on the horses.
- Don't overload the scaffolds.

Sectional steel and aluminum stairway scaffold: The sectional steel scaffold is the type used to support the heaviest loads. There are numerous safety precautions to observe when working from this type of scaffold, including:

- Inspect all scaffolds before using them.
- Never use any equipment that is damaged or deteriorated in any way.
- Keep all equipment in good repair.
- Avoid using corroded equipment; you never know how strong it is.

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- Inspect an erected scaffold regularly to ensure it is maintained in safe condition.
- Provide adequate sills for scaffold posts and use base plates.
- Use leveling jacks instead of blocking to adjust to uneven grade conditions.
- Plumb and level all scaffolds as the erection proceeds.
- Do not force braces to fit, level the scaffold until proper fit can be made easily.
- Fasten all braces securely.
- Do not climb on cross braces
- On wall scaffolds place and maintain anchors securely between structure and scaffold at least every 30 feet of length and 25 feet of height.
- Freestanding scaffold towers must be restrained from tipping by guying or other means.
- Equip all planked or staged areas with proper guardrails, mid-rails and toe-boards.
- Do not erect scaffolding near power lines.
- Do not use ladders or makeshift devices on top of scaffolds to increase the height.
- Do not overload scaffolds.

Planking:

- Use only lumber that is properly inspected and grades as scaffold plank.
- Planking shall have at least 12 inches of overlap and extend 6 inches beyond center of support, or be cleated at both ends to prevent sliding off supports.
- Fabricated scaffold planks and platforms, unless cleated or restrained by hooks, shall extend over their end supports not less than 6 inches nor more than 12 inches.
- Secure plank to scaffold when necessary.

Rolling scaffolding:

- Never ride a rolling scaffold.
- Secure or remove all material and equipment from platform before moving scaffold.
- Caster brakes must be applied at all times when scaffolds are not being moved.
- Casters with plain stems shall be attached to the panel or adjustment screw by pins or other suitable means.
- Do not move a rolling scaffold without sufficient help.
- Watch for holes in floor and overhead obstructions.
- Do not extend adjusting screws on rolling scaffolds more than 12 inches.
- Use horizontal diagonal bracing near the bottom and at 20-foot intervals.
- Do not use brackets on rolling scaffolds without consideration of overturning effect.
- The working platform height of a rolling scaffold must not exceed four times the smallest base dimension, unless guyed or otherwise stabilized.

The following instructions are not all-inclusive and the manufacturer's instructions should always be followed when erecting scaffolding.

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There are several steps to follow when erecting scaffolding including:

Step 1: Gather required tools and materials.

Having the proper equipment saves time by preventing you from having to go back to the shop and retrieve additional materials.

Step 2: Setting up the scaffold sections.

To erect scaffolding you must start from the ground and work your way up. Start by determining whether you need casters or base plates. (We have discussed casters in this step). Insert casters into the bottom of the end frame legs and lock into place with locking pins. Install pivoted diagonal and horizontal braces to lock end frames together. Make sure all locking hooks are firmly in position at each end of the separate horizontal and diagonal braces and at the lower end of stairways. Install the next layer of end frames and diagonal braces. The columns of each scaffold section have interlock clips positioned in the lower pair of holes at the upper ends. When you insert an upper section, move the interlock clips of the section below to the upper section bushings, interlocking the two sections. **Never erect a scaffold without interlocking the sections this way!** If the interlock clips are damaged or lost, replace them immediately. Continue this process until you reach the height that you desire. Make sure you follow all safety precautions concerning scaffold safety. After you reach your desired height, install 2x10 inch scaffold planks and clamp toe board into place. Bolt the top guardrail to the guardrail support. You will need to use a mid-rail when it is required by regulation, code or ordinances.

Step 3: Scaffold disassembly.

Extra care should be used when disassembling your scaffolding. After spending many long hours working from your scaffolding, your thoughts about safety may not be foremost. **Do not let that happen!** To disassemble scaffolding, follow the steps for assembly in reverse order. After disassembling, store the sections horizontally on supports.

Ladders: There are many types of wood, aluminum and fiberglass ladders used by the Structural specialist. Stepladders range in size from 4 to 20 feet. A one-piece ladder, the single straight ladder, is available in sizes of 8 to 26 feet. Extension ladders come in lengths up to 60 feet. Quality wood ladders are made from clear, straight grained, stock that is carefully seasoned. Ladders should be given a clear finish that permits easy visual inspection. When reconditioning a wood ladder, never use paint. Some tips to using and maintaining ladders are:

- Basic care and handling of ladders should always be followed.
- Ladders should be inspected frequently.
- Ladders that have developed defects should be repaired or destroyed.
- Always carry a ladder over your shoulder with the front end elevated.
- Do not drop a ladder, or let it fall. These impacts weaken the ladder.
- Store ladders horizontally on supports to prevent sagging.
- Do not store ladders near heat or out in weather.

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- Before climbing a ladder, be sure that both rails rest on solid footing.
- Make sure ladder side rails have safety shoes.
- Never use stepladders as substitutes for work stands.
- Always face ladder as you ascend or descend.
- Never leave an erected ladder unattended for any length of time.
- Don't leave tools on the top of a stepladder unless it has a special holder.
- Never use metal ladders where they might contact electric current.
- Never place the top or bottom of a ladder against an unstable surface.
- When you work from a ladder, work no higher than the third rung from the top.
- Before climbing a stepladder, be sure it is fully open and locked and that all four legs are on solid footing.
- If you use a ladder to get onto a roof or scaffold, the ladder must extend at least 36 inches beyond that surface.
- Get help in erecting long, heavy ladders.
- When the security of a ladder is endangered by other activities, rope off the area around it, fasten it securely, and assign a helper to steady the bottom.

When using ladders you should follow these steps:

Step 1: Ladder selection.

The first step to using ladders is selecting the correct one for the job you are doing.

Step 2: Erect ladder.

To erect a ladder, place the lower end against a solid base so it can't slide. Raise the top end to get under it. Walk toward the bottom end, grasping and raising the ladder rung by rung as you proceed. When vertical, lean it against the structure at the proper angle. Make sure the bottom ends of both rails rest on a firm base. You should place the ladder so the horizontal distance from its lower end to the vertical wall is 1/4 the length of the ladder.

Step 3: Ladder take down.

The procedure for taking down a ladder that is erected is the opposite of erecting one. Push the bottom towards the solid base so it can't slide. When the ladder gets vertical, walk toward the top end grasping and lowering the ladder rung by rung. After using the ladder, make sure you store it properly by hanging it horizontally on supports.

Review Questions for Erect Scaffolds and Ladders

Question	Answer
1. Which of the following is a main source of injury associated with scaffolding?	<ul style="list-style-type: none"> a. Using ladders on top of scaffolding. b. Falling from the scaffolding. c. From overloading scaffolding. d. From riding on rolling scaffolding.
2. Sectional steel scaffolds should be able to support _____ times the anticipated load of men and materials.	<ul style="list-style-type: none"> a. 2. b. 3. c. 4. d. 5.
3. How do you test scaffold boards before using them?	<ul style="list-style-type: none"> a. Look at them to see if they are bowed. b. Look at them to see if they are cracked. c. By setting them in place and jumping on them. d. By setting them on blocks and jumping on them.
4. Which of the following is not a safety precaution when using scaffolding?	<ul style="list-style-type: none"> a. Inspect all scaffolds before using them. b. Inspect erected scaffolding regularly ensuring it is maintained in an unsafe condition. c. Do not erect scaffolding near power lines. d. Do no use ladders or make shift devices on top of scaffolds to increase the height.
5. Any type of lumber can be used for planking.	<ul style="list-style-type: none"> a. True. b. False.
6. Planking should have at least _____ inches of overlap.	<ul style="list-style-type: none"> a. 6. b. 12. c. 18. d. 24.
7. Extension ladders come in lengths up to _____.	<ul style="list-style-type: none"> a. 20 feet. b. 26 feet. c. 60 feet. d. 80 feet.
8. Which of the following statements about ladders is not true?	<ul style="list-style-type: none"> a. Always carry a ladder over your shoulder with the front end elevated. b. Always use step ladders for work stands when it is fully opened and locked. c. Always face ladders as you ascend or descend. d. Always get help when erecting long, heavy ladders.

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ERECT SCAFFOLDS AND LADDERS

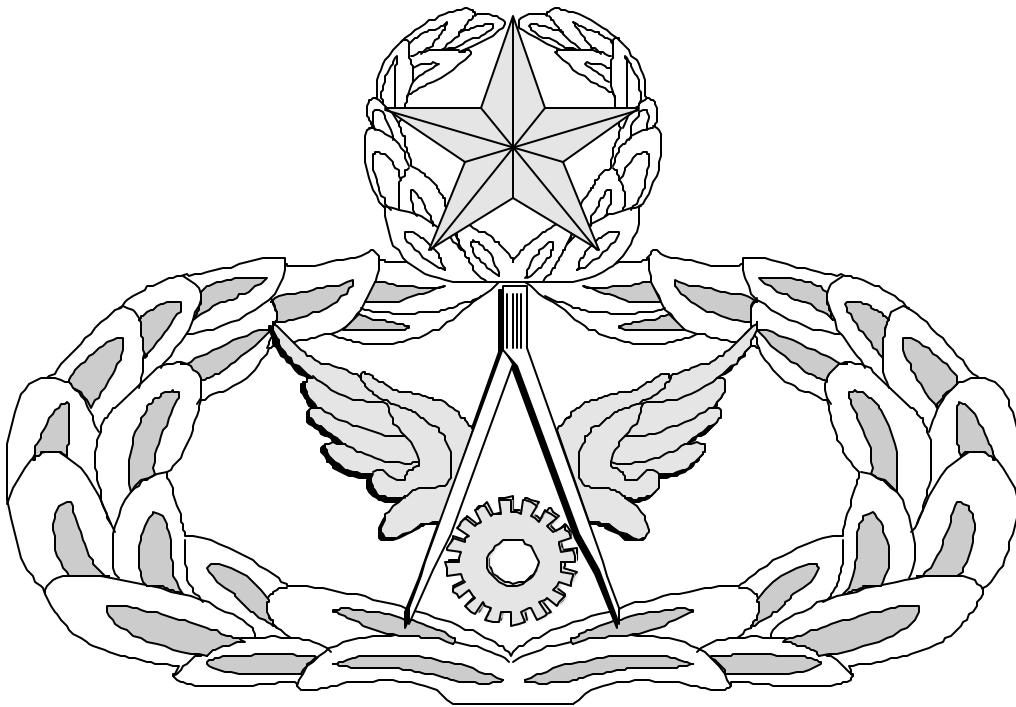
Performance Checklist		
Step	Yes	No
1. Did the trainee have the required equipment?		
2. Did the trainee follow all safety precautions for scaffolding?		
3. Did the trainee follow all safety precautions for ladders?		
4. Did the trainee set up the scaffolding correctly?		
5. Did the trainee tear down the scaffolding correctly?		
6. Did the trainee set up the extension ladder correctly?		
7. Did the trainee take down the extension ladder correctly?		
8. Did the trainee store the scaffolding sections correctly?		
9. Did the trainee store the extension ladders correctly?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and the trainer.

Air Force Civil Engineer

QUALIFICATION TRAINING PACKAGE (QTP)

REVIEW ANSWER KEY



For
STRUCTURAL

(3E3X1)

MODULE 14

TOOLS AND EQUIPMENT

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HANDTOOLS**(3E3X1-14.1.1.)**

Question	Answer
1. What type of saw is used to make cuts parallel to the wood grain.	c. Ripsaw
2. What type of saw has a thin blade that is reinforced with a metal strip along the top edge?	b. Backsaw
3. What determines the size of a hammer?	c. The weight of the head
4. What are the two common types of claw hammers?	a. Curved and straight.
5. What hammer is most useful when removing wood siding from an old building.	d. Straight claw hammer.
6. What square is most commonly used during building layout and erection?	c. Framing square.
7. The ends of a board can easily be checked for square by using.	d. Try square.
8. Which square can easily be used both to lay parallel lines and to lay out 45 degree and 90 degree lines?	b. Combination Square.
9. What driving tool should you use to strike chisels when making deep cuts?	c. Mallet
10. What is used to hone the edges on tools?	b. Oilstone
11. Screwdriver sizes are specified by _____.	a. The length of the blade, from the ferrule to the tip.
12. What tool is used to cut brick?	b. Brick set
13. What masonry tool is used first after concrete is placed?	c. Screed
14. What is the maximum cutting capacity of straight snips?	b. 20 gauge
15. Aviation snips with yellow handles are designed to cut _____.	c. Straight

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HANDTOOLS**(3E3X1-14.1.1.)**

Question	Answer
16. What are Prick Punches used for?	d. Establish location points
17. What are the three types of taps?	a. Taper, Plug, and Bottom
18. What tap is used when the hole goes all the way through the work.	a. Taper

CIRCULAR SAW**(3E3X1-14.1.3.)**

Question	Answer
1. The size of a circular saw is determined by what factor?	c. The size of the largest blade it uses
2. Which of the following types of blades is considered an all-purpose blade?	d. Combination
3. Why should you make sure the material you are going to cut with a circular saw is supported or fastened?	c. So that it will not shift or move during the cutting operation
4. Before any cutting operation you should _____.	c. All of the above
5. When cutting materials you should use which of the following procedures?	a. Hold the saw with one hand and place the other on the stock
6. You should never clean up after yourself.	b. False

ELECTRIC DRILL**(3E3X1-14.1.4.)**

Question	Answer
1. What are the two basic designs for portable electric drills?	a. Spade and pistol grip
2. At what angle to the work should you always hold the drill?	c. 90 degrees
3. Why should you withdraw the drill when drilling deep holes?	b. To remove the cuttings
4. What is the right angle drill used for?	b. Plumbing and electrical work
5. How are electric drill sizes determined?	d. By the chuck capacity

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RECIPROCATING SAW**(3E3X1-14.1.5.)**

Question	Answer
1. What is the common trade name used to describe reciprocating saws?	d. Saw-zall.
2. What materials are reciprocating saw blades made of?	a. High speed steel or carbon steel
3. You must become familiar with _____ when dealing with power tools?	d. Both a and c
4. What must you ensure when cutting through a wall?	d. All of the above
5. To start a cut, you should _____.	a. Start the motor and move the blade into the material.
6. How should you start an internal cut?	d. Drill a starter hole in the waste stock.
7. Why should you check clearance underneath your work before cutting?	b. To eliminate cutting sawhorses or other supports.
8. Metal surfaces should be wiped with _____.	d. Both a and c

POWER MITER SAW**(3E3X1-14.1.6.)**

Question	Answer
1. A _____ on the power miter saw is used to set the angle to the desired cut.	d. Scale
2. _____ cuts can be made on either side of the saw blade.	b. 45 degree
3. To swivel the saw blade on a power miter saw you must first _____.	a. Loosen the adjusting knob.
4. You can make freehand cuts using a power miter saw.	b. False
5. Start the saw before the blade contacts the _____.	c. Stock

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ROTARY HAMMER

(3E3X1-14.1.8.)

Question	Answer
1. Common sizes of masonry bits range from _____.	b. 1/4 to 1 inch diameter.
2. When drilling with a rotary hammer you must first determine _____.	a. The diameter and length of the bit required.
3. If a hole is not to be drilled completely through the masonry surface you can control the depth by adjusting _____.	b. The depth gauge.
4. Rotary hammers usually require little or no force to efficiently drill.	c. True
5. Rotary hammers are usually a heavy-duty drilling tool and generate a great deal of _____.	d. Torque.
6. To help minimize the chance of the bit binding during operation you should _____.	b. Partially withdraw the bit from the hole while drilling.
7. To start drilling a hole it may be easier if you _____.	c. Disengage the hammer action.

HAND GRINDER

(3E3X1-14.1.9.)

Question	Answer
1. The different sizes of the portable electric hand grinder indicate what?	d. Abrasive disk diameter
2. Thicknesses of grinder disks commonly range between?	d. 1/8 and 1/4 inch
3. Never grind non-ferrous metals.	a. True
4. Cup brushes and wire buffing wheels are very helpful for _____.	c. Removing corrosion from metals
5. To keep the arbor from turning while placing a disk on the hand grinder you should _____.	d. Depress the arbor-locking button.
6. Hand grinders generate a lot of dust and particles from _____?	b. Metal and the abrasive disk.

Notice. This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training if equipment is available. It is to be used in conjunction with these for training purposes only.

Question	Answer
7. A damaged power cord must be?	d. Replaced immediately.

ERECT SCAFFOLDS AND LADDERS

(3E3X1-14.3.)

Question	Answer
1. Which of the following is a main source of injury associated with scaffolding?	b. Falling from the scaffolding
2. Sectional steel scaffolds should be able to support _____ times the anticipated load of men and materials.	c. 4
3. How do you test scaffold boards before using them?	d. By setting them on blocks and jumping on them.
4. Which of the following is not a safety precaution when using scaffolding?	c. Inspect erected scaffolding regularly ensuring it is maintained in an unsafe condition.
5. Any type of lumber can be used for planking.	b. False
6. Planking should have at least _____ inches of overlap.	b. 12
7. Extension ladders come in lengths up to _____.	c. 60 feet.
8. Which of the following statements about ladders is not true?	b. Always use step ladders for work stands when it is fully opened and locked.